PB-230 049

POLLUTION OF THE INTERSTATE WATERS OF THE ESCAMBIA RIVER BASIN (ALABAMA-FLORIDA) AND THE INTRASTATE PORTIONS OF THE ESCAMBIA BASIN WITHIN THE STATE OF FLORIDA. PROCEEDINGS OF CONFERENCE, SESSION (2nd) HELD AT PENSACOLA, FLORIDA ON FEBRUARY 23-24, 1971. TRANSCRIPT OF PROCEEDINGS

Environmental Protection Agency
Atlanta, Georgia

24 February 1971

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PB 230 049

SECOND SESSION
OF
CONFERENCE

IN THE MATTER OF
POLLUTION OF THE INTERSTATE WATERS
OF ESCAMBIA RIVER BASIN (ALABAMA-FLORIDA)
AND THE INTRASTATE PORTIONS OF THE ESCAMBIA BASIN
AND BAY WITHIN THE STATE OF FLORIDA

held at

Pensacola, Florida

February 23-24, 1971

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TRANSCRIPT OF PROCEEDINGS

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The second session of a conference in the matter of pollution of the interstate waters of Escambia River Basin (Alabama-Florida) and the intrastate portions of the Escambia Basin and Bay within the State of Florida, held at the Municipal Auditorium, Pensacola, Florida, on February 23-24, 1971, at 9:30 a.m.

It includes statements, recommendations, and discussions on hydrography, circulation; benthic characteristics; water quality analysis and related information.

- - -

PRESIDING:

John C. White, Chairman
Director, Regulatory Programs
U. S. Environmental Protection Agency
Water Quality Office, Southeast Region
Atlanta, Georgia

CONFEREES:

Paul J. Traina, Director of Planning
U. S. Environmental Protection Agency
Water Quality Office, Southeast Region
Atlanta, Georgia

Nathaniel P. Reed, Chairman
Florida Department of Air & Water
Pollution Control
Tallahassee, Florida

Vincent D. Patton, Executive Director
Florida Department of Air & Water
Pollution Control
Tallahassee, Florida

Arthur N. Beck, Technical Director
Alabama Water Improvement Commission
Montgomery, Alabama

- - -

LIST OF SPEAKERS

Federal Speakers

R. W. Davis
Civil Engineer
U. S. Army Corps of Engineers
P. O. Box 2288
Mobile, Alabama

Thomas W. Duke
Laboratory Director
Environmental Protection Agency
Gulf Breeze Laboratory
Gulf Breeze, Florida

John A. Little
Director, Technical Services Program
Southeast Water Laboratory
Environmental Protection Agency
Athens, Georgia

Woodrow L. Lynn
Head of Engineering Department
Public Works Center (Navy)
Building 1, Naval Air Station
Pensacola, Florida

Alabama Speakers

J. L. Crockett, Jr.
Director, Technical Staff
Alabama Water Improvement
Commission
State Office Building
Montgomery, Alabama

George H. Whiteside
General Manager
Container Corporation of America
Brewton, Alabama

Florida Speakers

E. L. Addison
Vice President
Gulf Power Company
P. O. Box 1151
Pensacola, Florida

L. F. Currier
Engineer Structures
L & N Railroad Company
Louisville, Kentucky

J. F. de Castro
Chief Bureau of Enfocement
Florida Department of Air and Water
Pollution
Tallahassee, Florida

Dr. Joe A. Edmisten
Director, Office of Environmental
Studies, U. W. F.
8108 Monticello Drive
Pensacola, Florida

K. K. Huffstutler
Chief, Bureau of Surveillance
Florida Department of Air &
Water Pollution Control
Tallahassee, Florida

G. J. Kenngott
Manager, Santa Rosa Plant
American Cyanamid Company
Milton, Florida

John D. Kramer
Technical Manager
Escambia Chemical Corporation
P. O. Box 467
Pensacola, Florida

James E. Lipe
General Supervisor, Manufacturing
and Technology, Monsanto Company
Box 1507
Pensacola, Florida

Florida Speakers, cont.'

C. E. Locke
Private Citizen
1801 E. Mallory Street
Pensacola, Florida

A. Ray Richards
Executive Vice President
Florida Wildlife Federation
1001 N. 14th Avenue
Avalon Beach, Florida

Dr. Robert E. Smith
Director
State University System of Florida
Institue of Oceanography
830 1st Street S.
St. Petersburg, Florida

Wayne E. Tisdale
Regional Engineer
Florida Division of Health
P. O. Box 2666
Pensacola, Florida

Tom Webb
Director of Administration
Department of Transportation
Tallahassee, Florida

OTHERS IN ATTENDANCE

James Abrams
Monsanto
Pensacola, Florida

Joe Addison
Fishery Biologist
Alabama Department of
Conservation
P. O. Box 504
Fairhope, Alabama

Jo Ann Allen
Star Route
Box 605
Lillian, Alabama

Wade Allen
Area Development
Gulf Power Company
Pensacola, Florida

Bjarne B. Andersen, Jr.
Assistant Attorney General
Stateof Florida & Department
of Air and Water Pollution
Control
Department of Legal Affairs
The Capitol
Tallahassee, Florida

F. C. Apel
Route 1
Box 647
Pensacola, Florida

George Apfel
Environmental Engineer
American Cyanamid Company
Berdan Avenue
Wayne, New Jersey

Sam Armour
County Commissioner
Escambia County
P. O. Box 1111
Pensacola, Florida

John T. Aronson
Engineer
Monsanto
Pensacola, Florida

Sherlee M. Aronson
League of Women Voters
State Board - Environmental Quality
850 Woodbine Drive
Pensacola, Florida

Mrs. D. C. Barfield
Chairman, Garden Club - Native Garden
Pensacola Federation of Garden Clubs
181 N. Spring Street
Pensacola, Florida

Fred Barloga
Research Coordinator
Florida Coastal Coordinating Council
Larson Building
Tallahassee, Florida

Arthur N. Beck
Technical Coordinator
Alabama Water Improvement Commission
State Office Building
Montgomery, Alabama

H. C. Beers
Membership Committee Chairman
Gulf Atlantic - Oceanograpic Research
Society
623 Sheppard Drive
Warrington, Florida

James T. Bell, Jr.
Chief Chemist
Monsanto
Anniston, Alabama

W. Y. Bennett
Professor of Biology
1000 College Boulevard
Pensacola, Florida

Herbert F. Berger
Regional Engineer
National Council Air & Stream
Improvement
P. O. Box 14483
Gainesville, Florida

Joe Blanchard
Coordinator, Fish Management Section
Florida Game & Fresh Water Fish Commission
Tallahassee, Florida

John M. Bolton
Assistant Director, Technical Staff
Alabama Water Improvement Commission
State Office Building
Montgomery, Alabama

E. H. Bomke
Vice President, Electrical Operations
Gulf Power Company
75 N. Pace Boulevard
Pensacola, Florida

Mrs. Jack Bouffard
United Citizens Against Pollution
206 Dolphin Street
Gulf Breeze, Florida

Diane Bradley
Route 7, Box 91G
Milton, Florida

LTJG K. A. Braun
Port Security Officer
U. S. Coast Guard
Coast Guard Base
Mobile, Alabama

Ronald Breeden
Student of Biology
University of West Florida
3846 Menendez Drive
Pensacola, Florida

Charles A. Britton
1314 Cypress Street
Pensacola, Florida

J. D. Brown
400 Colbery Avenue
Warrington, Florida

M. R. Chmura
Escambia Chemical
P. O. Box 467
Pensacola, Florida

Gary H. Cook
Chemistry Teacher
Woodlane High School
Route 3, P. O. Box 16-2
Pensacola, Florida

Van R. Cooper
USN
BOQ
Naval Air Station
Pensacola, Florida

Gilfford D. Cotton
Gulf Breeze High School
825 Wayne Avenue
Warrington, Florida

Ben T. Christian
Route 7, Box 136
Milton, Florida

John L. Crew
Fishery Biologist
Game & Fish Commission
P. O. Box 128
DeFuniak Springs, Florida

Brian P. Crowley
Supervisory Auditor
General Accounting Office
3102 N. Adams
Woodbridge, Virginia

B. T. Dean
Supervisor, Waste and Water Services
Monsanto
21 Janet Street
Pensacola, Florida

P. J. Doherty
Regional Engineer
Florida Department of Air and Water Pollution Control
1384 Shoreline Drive
Gulf Breeze, Florida

Roy L. Duggan
Environmental Engineer
Escambia Chemical Company
P. O. Box 467
Pensacola, Florida

Others in Attendance, cont.'

C. L. Ellis
Ellis Pollutant Company
6303 Boea Del Circle
Pensacola, Florida

Pat Emmanuel
American Cyanamid Company
34 West Government
Pensacola, Florida

John C. Fay, Jr.
Technical Division
Container Corporation of America
Box 709
Brewton, Alabama

Mrs. Robert L. Gade
Subcommittee Chairman for Sanitation - ACOP
Route 1, Box 791
Pensacola, Florida

Jack T. Garrett
Manager Pollution Abatement
Monsanto Company
800 N. Lindberg Boulevard
St. Louis, Missouri

Margaret Glasscock
Department of Air and Water Pollution Control
1384 Shoulwe Drive
Gulf Breeze, Florida

Mrs. John J. Guice
Conservation Activities Chairman
F. F. G. C.
42 Highpoint Drive
Gulf Breeze, Florida

Keitz Haburay
Associate Professor PJC
Pensacola Jr. College
6000 Keating Road
Pensacola, Florida

L. H. Hargrove
Administrative Assistant
Florida Department of Transportation
Tallahassee, Florida

W. B. Harrison
Vice President
Southern Services, Inc.
P. O. Box 2625
Birmingham, Alabama

Benton A. Hause
CSC Inter Government Affairs
Fellowship Program
6448 Queen Anne Terrace
Falls Church, Virginia

R. J. Henderson
District Manager
G. L. Simonds Company
P. O. Box 984
Pensacola, Florida

W. Carroll Hixson
Conservationist
Bream Fisherman Association
1333 North Spring Street
Pensacola, Florida

Thomas Scott Holden
3025 W. Blount
Pensacola, Florida

Dr. Robert L. Hughes
Pastor, Lakeview Baptist Church
Lakeview Baptist Church
4707 Marseille Drive
Pensacola, Florida

Roy L. Hyatt
Project Director
Environmental Sensitivity Project
2501 North Hayne Street
Pensacola, Florida

Larry Johnson
Fisheries Biologist
Alabama Department of Conservation
P. O. Box 504
Fairhope, Alabama

Charles Lambert
3750 Forest Circle
Pensacola, Florida

Others in Attendance, cont.'

Ken Larson
Television News
WEAR - TV
Mobile Highway
Pensacola, Florida

George O. Layman
Superintendent Production
and Construction
Gulf Power Company
P. O. Box 1151
Pensacola, Florida

R. C. Lava
Personnel Superintendent
American Cyanamid Company
Milton, Florida

H. C. Levin
Manager Community Relations
American Cyanamid Company
Wayne, New Jersey

Curtis G. Linke
Assistant Manager, Public
Relations
Container Corporation
One First National Plaza
Chicago, Illinois

Dr. Robert Livingston
Consultant
Department of Transportation
Tallahassee, Florida

Lt. Commander George H. Liveakos
Terminal Manager
Leonard Brothers Trucking Company
860 Copley Drive
Pensacola, Florida

Charles A. Lowery
Chairman, ACOP
Escambia County Court
House
Pensacola, Florida

Mrs. George H. Liveakos
860 Copely Drive
Pensacola, Florida

James H. Lynhal
6 Bay Drive, N.E.
Ft. Walton Beach, Florida

W. Major
Route 5, Box 58
Covington, Virginia

Allan K, McMillan
Plant Manager
Escambia Chemical Corporation
P. O. Box 467
Pensacola, Florida

Roland M. McPherson
Marine Biologist
USPHS/FDA
Shellfish Sanitation Branch
Dauphin Island, Alabama

Donal K. Mitchell
Route 3, Box 243-B
Pensacola, Florida

Edward K. Meier
Secretary and Assistant General
Counsel
Container Corporation of America
One First National Plaza
Chicago, Illinois

A. O. Merritt
Route 1, Box 615
Pensacola, Florida

Stella Metos
1400 Tallahassee Street
Avalon Beach, Florida

Mrs. E. R. Moffett
Route 7, Box 446
Pensacola, Florida

Chuck Monteith
Gulf Breeze Science Club
10 San Carlos Street
Gulf Breeze, Florida

Charles H. Moss, Jr.
Assistant News Director
WCOA Radio
P. O. Box 1669
Pensacola, Florida

Others in Attendance, cont.'

Mary Ann Nicholson
Graduate Student
University of Florida
Route 3, Box 312 #J-2
Pensacola, Florida

Del R. Nimmo
Fishery Biologist
EPA
Gulf Breeze Laboratory
Gulf, Breeze, Florida

J. I. Niuen
Bream Fisherman Association
1803 E. Lakeview Avenue
Pensacola, Florida

Joel Norman
Bream Fisherman Association
4508 Guerrain Drive
Pensacola, Florida

John C. Nyhan
Natural Resources Manager
EPA - Water Quality
c/o Mobile Corps of Engineers
Mobile, Alabama

Wiley C. Page
Jr. Planner
Regional Planning Council
803 N. Palafox Street
Pensacola, Florida

P. S. Park
Senior Attorney
Monsanto Company
800 N. Lindbergh Boulevard
St. Louis, Missouri

Fred Peel
D. O. T. - 3rd District - Planning
Chipley, Florida

Bill Penrose
Director, Public Relations
Department of Transportation
Tallahassee, Florida

Clayton W. Perry
Escambia Harbor
Patrolman
Pensacola Port Commissioners
406 Gibbs Road
Warrington, Florida

William E. Perry
Consultant
16 Gilmore Drive
Gulf Breeze, Florida

J. J. Pinke
Maintenance Superintendent
American Cyanamid
Milton, Florida

W. M. Reast
343 Gamarre Road

Gordon A. Richmond
Director, Sanitary Engineering
Hall, Mayo, Sims, & Associates
P. O. Box 1073
Pace, Florida

Jack C. Rosenau
Hydrologist
U. S. Geological Survey
Room 414, 1309 Thomasville Road
Tallahassee, Florida

John A. Sauer
Process Control Supervisory
Monsanto Company
3635 Firestone Boulevard
Pensacola, Florida

Michael Dean Schmitt
Graduate Res. Asst. - UWF
3 Utah Circle
Pensacola, Florida

Schoor
Box 234
Point Clear, Alabama

Ralph Scott
Chief, Paper Forest Ind. Res.
FWQA - PNWL
Corvallis, Oregon

Roy L. Sherman
Assistant General Attorney
L & N Railroad Company
908 West Broadway
Louisville, Kentucky

Mrs. Charles F. Smith, Jr.
Route 4, Box 57
Pensacola, Florida

Others in Attendance, cont.'

Dr. Robert E. Smith
Director
State University System of Florida
Institute of Oceanography
830 1st Street South
St. Petersburg, Florida

Rick Sprague
Regional Planner
Escambia Santa Rosa
Regional Planning Council
P. O. Box 486

Medie T. Still, Jr.
Technical Superintendent
St. Regis Paper Company
P. O. Box 1591
Pensacola, Florida

Maynard Stitt
Senior Public Relations
Manager
St. Regis Paper Company
P. O. Box 1591
Pensacola, Florida

Mrs. Theo Toner
Conservation Chairman
Federation of Garden Clubs
1001 Pennsylvania Drive
Pensacola, Florida

Paul E. Trout
Director Environmental Control
Container Corporation of America
Oaks, Pennsylvania

Stirling Turner
Governmental & Civic Affairs
Monsanto Company
P. O. Box 1507
Pensacola, Florida

J. J. Vick
1426 Bayshore Terrace
Gulf Breeze, Florida

R. M. Warren
P. O. Box 45
Gulf Breeze, Florida

James W. Warr
Assistant Sanitary Engineer
Alabama Water Improvement Commission
870 Karen Road
Montgomery, Alabama

Roger N. Watts
Attorney
Container Corporation of America
One Fist National Plaza
Chicago, Illinois

Bob Watson
Civil Engineer
Corps of Engineer
Airport Boulevard
Mobile, Alabama

Frank H. Wessels
Field Representative
Calgon
Mobile, Alabama

Frank Westmark
District Manager, Public Relations
St. Regis Paper Company
Pensacola, Florida

Alford J. Wilson, Jr.
Chemist
EPA
Sabine Island
Gulf Breeze, Florida

Wayne Withers
Attorney
Monsanto Company
800 N. Lindbergh Boulevard
St. Louis, Missouri

Arthur J. Zabinski
Waste Water Specialist
4907 Springhill Drive
Pensacola, Florida

Lt. Lewis E. Zangas
Department of Natural Resources
P. O. Box 168
Pensacola, Florida

PROCEEDINGS

OPENING STATEMENT

BY

MR. JOHN C. WHITE

MR. WHITE: The conference is open.

This Second Session of the Conference in the Matter of Pollution of the Interstate Waters of the Escambia River Basin (Alabama and Florida) and the Intrastate Portions of the Escambia Basin and Bay within the State of Florida is being held under the provisions of Section 10 of the Federal Water Pollution Control Act, as amended.

Under the provisions of the Act, the Administrator of the Environmental Protection Agency (this authority was formerly vested in the Secretary of the Interior) is authorized to call a conference of this type when requested to do so by the Governor of a State. On the basis of a written request from the Honorable Claude R. Kirk, Jr., former Governor of Florida, dated December 1, 1969, the Secretary of the Interior called a conference to consider the pollution in the interstate and navigable waters of the Escambia River Basin and Bay. The first conference was held January 20 and 21, 1970, in Gulf Breeze, Florida.

As specified in Section 10 of the Act, the Florida

Department of Air and Water Pollution Control and the Alabama Water Improvement Commission have been notified of this reconvened conference.

Both the State and Federal Governments have responsibilities in dealing with water pollution control problems. The Federal Water Pollution Control Act declares that the States have primary rights and responsibilities for taking action to abate and control pollution. Consistent with this, we are charged by law to encourage the States in these activities.

At the same time, the Administrator of the Environmental Protection Agency is charged by law with specific responsibilities in the field of water pollution control in connection with pollution of interstate and navigable waters. The Federal Water Pollution Control Act provides that pollution of interstate or navigable waters which endangers the health of welfare of any persons shall be subject to abatement. This applies whether the matter causing or contributing to the pollution is discharged directly into such waters or reaches such waters after discharge into a tributary.

The purpose of the conference is to bring together the State water pollution control agencies, representatives of the Environmental Protection Agency, and other interested parties to review the existing situation, and the progress which has been made, to lay a basis for future action by all parties concerned, and to give the State, localities, and industries an opportunity to take any indicated remedial action under the State and local law.

The Florida Department of Air and Water Pollution Control will be represented by Mr. Nathaniel Reed and his designee, Mr. Vince Patton.

The Alabama Water Improvement Commission will be represented by Mr. Arthur Beck and his designee, Mr. Joe Crockett.

The Federal conferee is Mr. Paul Traina, who is Director of the Regional Planning Office, Southeast Region, Water Quality Office, Environmental Protection Agency.

My name is John C. White. I am from the Atlanta Regional Office of the Water Quality Office of the Environmental Protection Agency and the representative of Mr. Ruckelshaus.

The parties to this conference are the official State water pollution control agencies and the Environmental Protection Agency. Participation in the conference will be open to representatives and invitees of these agencies and such persons as inform me they wish to present a statement. However, only the representatives of the Florida Department of Air and Water Pollution Control and the Alabama Water Improvement Commission and the Environmental Protection Agency constitute the conferees.

Opening Statement - Mr. White

At the first conference session, the conferees unanimously recommended a program of necessary action. The recommendations of the conferees are as follows:

To reduce or eliminate the accelerated eutrophication of Escambia Bay and Mulat-Mulatto Bayou, and to provide water quality suitable for a wide diversity of desirable uses, the following water quality management and waste abatement program is recommended to be accomplished, except as otherwise specified, but not later than December 31, 1972:

1. There shall be reductions of 94 percent carbonaceous, 94 percent nitrogenous, and 90 percent phosphorus wastes respectively discharged to Escambia River and Bay from major sources in Florida, including American Cyanamid, Escambia Chemical, Monsanto, and the city of Pensacola northeast sewage treatment plant. Due to the distance from Escambia Bay of Container Corporation of America's plant site, a reduction of 90 percent carbonaceous and phosphorus wastes will be required. The conferees, after evaluation of the material to be presented for the record during the next 15 minutes following this conference, and after consultation with the parties involved, will recommend allowable waste discharges for each of the major sources. All waste sources shall provide complete removal of settleable solids.

2. An alternative for accomplishing these objectives

is the construction of a sewer collection system or systems around the entire bay to intercept wastes from American Cyanamid, Escambia Chemical, Monsanto, and northwest sewage treatment plant, as well as future and minor present effluents. This is consistent with the concept of metropolitan planning for waste management. All domestic and industrial wastes could be treated at a central facility with discharge away from Escambia Bay after the recommended carbon, nitrogen, and phosphorus reductions have been accomplished.

3. Color in the Escambia River at the Alabama-Florida State line as measured at the Highway 4 bridge near Century, Florida, shall be reduced to levels meeting Alabama, Florida, and Federal standards.

4. No further construction dredging shall be permitted in Escambia Bay or Mulat-Mulatto Bayou until a plan for development of the shoreline has been established. At that time, construction dredging shall be permitted only in accordance with the plan, to be completed within one year by representatives of Escambia and Santa Rosa Counties, the city of Pensacola, the State of Florida, the U. S. Army Corps of Engineers, and the U. S. Department of the Interior, now known as the Environmental Protection Agency. Any necessary maintenance dredging in the interim shall be conducted by diking the dredging area. Maintenance of existing channels shall be by

hydraulic pipeline dredging only. Disposal of all dredged material shall be to upland spoil sites.

5. The Louisville & Nashville Railroad Company bridge across Escambia Bay shall be rebuilt or modified by not later than January 1, 1973, to eliminate the piling adversely affecting the circulation and exchange of water in Escambia Bay.

6. The American Cyanamid Company shall immediately cease discharging acrylonitrile.

7. The Monsanto Company and Gulf Power Company, by not later than January 1, 1973, shall abate the excessive heat being discharged in their respectively cooling water effluents.

8. Century, Florida, and East Brewton, Alabama, by not later than December 31, 1972, shall install secondary waste abatement facilities acceptable to their respective State water pollution control agencies.

As noted previously, the conference has been reconvened to consider the progress which has been made to abate the pollution of the Escambia River Basin and to make any further recommendations or modifications of the previous recommendations that the conferees deem necessary.

Now, just a word about procedures. The conferees will be called upon to make statements. The conferees, in addition, may call upon participants whom they have invited to the conference to make statements. In addition, we shall call upon all other interested individuals who have indicated that they wish to present statements. At the conclusion of each statement, the conferees will be given an opportunity to comment or ask questions. This procedure has proven effective in all past conferences in reaching equitable solutions.

One point that should be made completely clear is that the parties to the conference are seated at this head table. In order to carry on an orderly proceeding, we do not permit questions or comments from the floor. Please come forward when you are called and make your comments at that time and ask any questions that you have and we will attempt to answer them.

Everyone will be given an opportunity to present anything that is relevant for the consideration of the conferees.

At the end of all the statements, we shall have a discussion among the conferees and try to arrive at a basis of agreement on the facts which have been presented. Then we shall go into executive session. Following this session the conferees will announce revised conclusions and recommendations which have been dictated by the facts of the situation as they appear today.

Under the Federal law, the Administrator of the Environmental Protection Agency is required at the conclusion of the conference to prepare a summary which will be sent to the conferees. The conclusions and recommendations of the conferees do not have any basis in law until they are adopted by the Administrator.

A record and verbatim transcript of the proceedings is being made by Mrs. Virginia Rankin. This is made for the purpose of a summary and to assist the conferees in arriving at a decision. We will publish a transcript of the record and this takes approximately six months. I think we were possibly a little longer with the first session, I don't know, but we will try to expedite this and get it out.

If you wish a report before this transcript is presented, I would suggest that you make arrangements with Mrs. Rankin independently and I am sure she will be happy to provide them for you. She is an independent contractor and, of course, you will be forced to make your own arrangements.

I would like to suggest that all speakers and participants other than conferees making statements come forward to the lectern which we provided and identify themselves for the purpose of the record.

Now I would like to call on the Federal conferee, Mr. Traina, for the Federal presentation.

MR. TRAINA: Thank you, Mr. Chairman.

The Federal reports, there will be two of them, will be presented by Mr. John A. Little, who is Director of our Technical Services Program in Athens, Georgia.

Mr. Little.

JOHN A. LITTLE, DIRECTOR
TECHNICAL SERVICES PROGRAM, EPA - WATER
QUALITY OFFICE, SOUTHEAST WATER LABORATORY, ATHENS, GEORGIA

MR. LITTLE: Mr. Chairman, conferees.

My name is John A. Little. I am Director of the Technical Services Program, Southeast Region, Water Quality Office of the Environmental Protection Agency.

Two technical studies have been conducted by staff of the Southeast Water Laboratory since the January 1970 Escambia River and Bay enforcement conference. One of these studies was directed toward obtaining additional information on circulation characteristics of Escambia Bay during a period of high river flow. At the same time chemical and physical characteristics of bottom sediments in the bay were restudied.

The second study dealt directly with Recommendation No. 1 of the 1970 conference which called for a 90 percent reduction in carbonaceous waste at the Container Corporation of America paper mill at Brewton, Alabama. A detailed analysis of carbonaceous waste characteristics at the mill was made in order to arrive at a specific allowable waste discharge loading. Reports have been prepared for both the bay and the mill studies. Recommendations are contained in each which reflect the additional information obtained and water quality conditions observed over the past year.

Titles of the reports are Circulation and Benthic Characterization Studies Escambia Bay, Florida, February 1971, and Container Corporation of America, Brewton Plant, Conecuh-Escambia River Basin Study, February 1971.

Mr. Chairman, I would like to have both of these reports introduced into the record in their entirety and I will read the pertinent sections in each at this time.

MR. WHITE: Without objection, they will be entered into the record as if read.

(The reports referred to by Mr. Little follow:)

CIRCULATION AND BENTHIC
CHARACTERIZATION STUDIES
ESCAMBIA BAY, FLORIDA

Environmental Protection Agency
Water Quality Office
Southeast Water Laboratory
Technical Services Program
Athens, Georgia

February 1971

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INTRODUCTION

The "Effects of Pollution on Water Quality - Escambia River and Bay, Florida"(1) were investigated during a period of low Escambia River discharge (1,068 cfs) in September and October, 1969. The tidal circulation and bottom sediment characteristics of the bay were reported. Further circulation and more extensive sediment characterization studies were made in June, 1970, at much higher river flows (59,533 cfs). This report presents these results and compares them with those of the 1969 study.

FINDINGS

Both studies show that Escambia Bay sediments are highly organic and tidal circulation in Upper Escambia Bay is poor. Because of these conditions, sediment disturbances--such as result from dredging--can cause severe oxygen depletion. Massive fish kills could result.

Escambia Bay circulation is generally counterclockwise at both low and high Escambia River flows (1,068 and 59,533 cfs). Water flows out from the west portion of the bay; saline water intrudes on the eastern side. Fresh-water flushing is more significant than saline water circulation exchange when river discharge exceeds the mean annual discharge. The Escambia River flows southeastward into the bay, creating a large eddy current counterclockwise to the north, which impedes tidal exchange in Upper Escambia Bay. During low-flow periods, the small creeks in the extreme northern end of the bay do not discharge a sufficient amount of fresh water to flush the area, and persistent pollutants are effectively trapped.

The piling--primarily unused and unnecessary piling--of the Louisville and Nashville Railroad Company bridge restricts circulation between Upper and Lower Escambia Bay.

Organic carbon content of bay sediment ranges from 2.3 to 5.0%. Sediment containing more than 3.0% organic carbon covers 46% of the upper bay. These results agree with the previous study.

About 40% of the upper bay sediment contains more than 0.2% total organic nitrogen; 35% of the same area contains more than 0.03% phosphorus. Total oxygen demand (TOD) of sediments ranged from 25 to 100 g/kg (dry weight). Thirty percent of upper bay sediment TOD exceeds 100 g/kg.

Unconsolidated sediment depth ranged from less than two to greater than six feet. About one-third of the upper bay is covered with unconsolidated sediment greater than six feet deep.

The benthic characterization study also shows counterclockwise bay circulation. The benthic study suggests that wastes discharged along the eastern shore of the bay (from American Cyanamid and Escambia Chemical companies) are generally swept northwestward and deposited along with wastes from Monsanto and Container Corporation in the central and western portions of the upper and lower bay.

RECOMMENDATIONS

1. Recommendations Numbers 1 and 2 of the 1970 Federal-State Enforcement Conference(2) which deal with adequate treatment and/or complete removal of Escambia Bay waste sources should be implemented at the earliest date in order to eliminate the continued buildup of organic sediment deposits in Escambia Bay.
2. The prohibition on construction and control of maintenance dredging, Enforcement Conference Recommendation Number 4, should be extended until the artificial buildup of organic sediment deposits ceases and these deposits stabilize. Spoil from all dredging--now and in the future--should be deposited on diked upland locations.
3. Modification of the Louisville and Nashville Railroad trestle, Enforcement Conference Recommendation Number 5, should include removal of unused and unnecessary bridge piling and old construction debris. This should minimize any effect the bridge has on bay circulation.

PHYSIOGRAPHY

Gemorphology

Escambia Bay is one of the northeast branches of Pensacola Bay (see foldout map). It is a relatively shallow body of water, ranging from one to 20 feet deep, averaging eight feet at mean low water (M.L.W.). Water depth increases from the northern end southward to the mouth, a distance of 11 miles.

The Escambia River enters the bay along the western shore approximately 2½ miles south of the head of the bay. Marshy wetlands and small creeks characterize the north end of the bay. The principal physiographic features of the eastern shore include Mulatto Bayou, located across the bay and south of the Escambia River mouth, and Indian and Trout Bayous, located just south of mid-bay. The bay is approximately two miles wide from its extreme northern portion to the Escambia River. The bay width increases to 3½ miles just below the Escambia River, decreases to approximately two miles between Lora and Live Oaks points, then increases relatively uniformly to its maximum of 5½ miles at the mouth. The surface area of the bay is 24,300 acres (1.02×10^9 square feet) and the volume is 194,400 acre-feet (8.47×10^9 cubic feet), both at M.L.W.

The principal man-made features of the bay include: The U. S. Highway 90 bridge, which crosses the bay at the extreme northern end; the L&N Railroad bridge, which crosses the bay between Lora and Live Oaks points; and the I. S. Highway 10 bridge, which crosses the bay just south of the L&N Railroad bridge. A 100-foot wide navigation channel, maintained at a depth of ten feet (M.L.W.), traverses the bay from north to south.

For the purpose of this report, the bay will be artifically divided into Upper Escambia Bay--that portion of the bay north of the L&N Railroad bridge--and Lower Escambia Bay. Upper Escambia Bay has a surface area of 7,000 acres (3.05×10^8 square feet), a volume of 35,000 acre-feet (1.52×10^9 cubic feet), and a mean depth of five feet, all at M.L.W. The lower bay has a surface area of 17,300 acres (7.54×10^8 square feet), a volume of 159,400 acre-feet (6.94×10^9 cubic feet), and a mean depth of nine feet, all at M.L.W.

Hydrology

The principal fresh-water input to Escambia Bay is the Escambia River. The Escambia River is 91.8 miles long and drains 4,200 square miles of southeastern Alabama and northwestern Florida. The majority of the drainage basin in in Alabama and is characterized by hilly terrain with many perennial streams.

The furthest downstream measurement of discharge is the U. S. Geological Survey gaging station at river mile 48.8 near Century, Florida. The drainage basin area above the gage is 3,817 square miles. Based on a 30-year record at this station, the maximum recorded river flow is 77,200 cfs, and the minimum is 596 cfs. The seven-day minimum flow with a recurrence interval of ten years is 785 cfs. Table I shows the mean monthly flows for the water years 1951-1966. The mean annual discharge for the period of record was 5,460 cfs(3, 4, 5).

The Escambia River discharge during the studies of September, 1969, and June, 1970, is shown in Table II. Allowing for a four-day time of travel (1) from Century, Florida, to Escambia Bay, the average discharge during the study periods was 1,068 cfs and 59,533 cfs respectively.

Table I

ESCAMBIA RIVER NEAR CENTURY, FLORIDA

MONTHLY MEAN DISCHARGE

1951-1966 Water Years

cfs

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	ANNUAL
Maximum	12,970	21,160	19,630	26,960	16,160	8,910	7,022	6,143	6,037	8,735	6,971	24,600	26,960
Mean	6,045	9,197	10,409	11,420	5,044	3,211	3,187	2,539	2,651	2,743	2,477	5,434	5,460
Minimum	1,895	3,588	1,783	2,995	1,556	1,256	1,365	939	708	666	1,033	1,157	666

Table II

ESCAMBIA RIVER DISCHARGE NEAR CENTURY, FLORIDA

September 1969 and June 1970 Studies

DATE	MEAN DAILY DISCHARGE cfs
Sept. 1969	
17	932
18	914
19	914
20	1,030
21	1,260
22	3,960
23	9,130
24	11,600
25	11,500
June 1970	
1	18,300
2	26,600
3	37,600
4	56,800
5	65,700
6	56,100
7	51,200
8	49,900
9	51,000
10	52,800
11	49,800

Provisional discharge
NOTE: Data supplied by the USDI, Geological Survey, Tallahassee, Florida.

Tidal Considerations and Flushing Characteristics

Tides in the Pensacola Bay system are of the mixed type with generally one high and one low tide daily. Escambia Bay has a tidal range of 1.5 feet at Lora Point, which is larger than the 1.1-foot tidal range at the entrance to Pensacola Bay(6). During the September, 1969, and June, 1970, studies, a tide gage was located at McMillan's Fish Camp (see foldout map) to record relative tide heights, which are shown in Figures 1 and 2.

The tidal prism is one of the flushing parameters of an estuary, defined as the mass of water exchanged on an average tidal cycle. The tidal prism of Escambia Bay is 36,450 acre-feet (1.59×10^9 cubic feet). compared to a total bay volume of 194,400 acre-feet (8.47×10^9 cubic feet). Therefore, 18.8% of the bay volume is exchanged every tidal cycle due to tidal considerations only. Another flushing parameter is the displacement time, defined as the time required to fill, or displace completely, the volume of an estuary with the incoming fresh water. The displacement time for Escambia Bay as a whole is 18.0 days; for Upper Escambia Bay alone it is 3.2 days (both based on the mean annual river discharge).

Climatology

The mean annual temperature for the Pensacola area is 68°F, and the average rainfall is 63 inches. Monthly temperatures and rainfall variations for Pensacola, which influence circulation patterns in Escambia Bay, are shown in Table III(7).

FIGURE 1

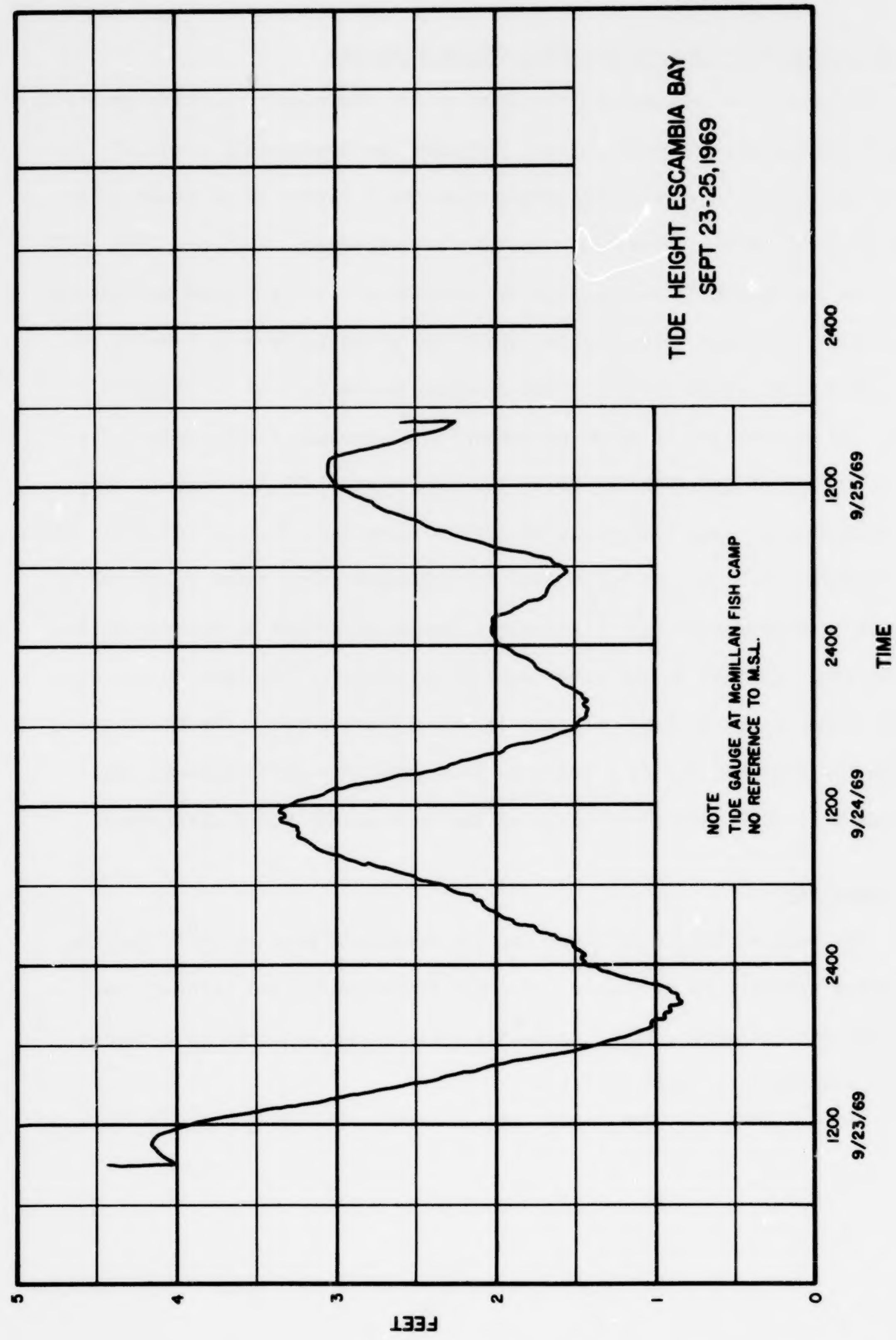
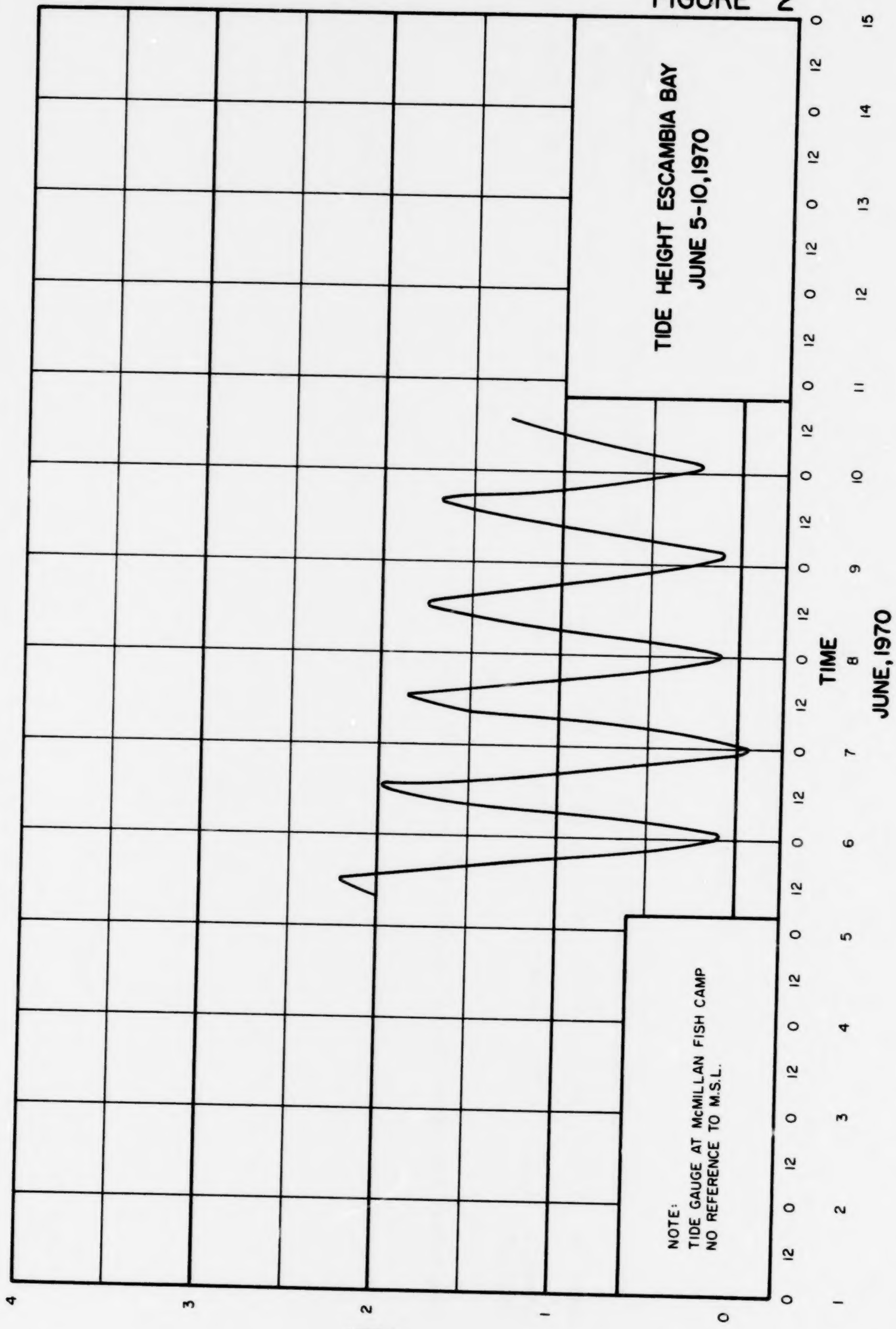

TIDE HEIGHT ESCAMBIA BAY
SEPT 23-25, 1969
NOTE
TIDE GAUGE AT McMILLAN FISH CAMP
NO REFERENCE TO M.S.L.
FEET
0
1
2
3
4
5
TIME
1200
9/23/69
2400
1200
9/24/69
2400
1200
9/25/69
2400

FIGURE 2



TIDE HEIGHT ESCAMBIA BAY
JUNE 5-10,1970

NOTE:
TIDE GAUGE AT McMILLAN FISH CAMP
NO REFERENCE TO M.S.L.

Table III

MEAN TEMPERATURE AND RAINFALL DATA

Pensacola Airport Weather Station

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	ANNUAL
Temp. ^{o}F	53.5	56.1	61.0	67.9	75.5	81.1	81.7	81.5	78.2	70.4	59.5	54.3	68.4
Rainfall (inches)	4.22	4.25	6.04	5.25	4.56	5.43	8.02	6.97	7.69	2.98	3.24	4.22	62.9

Mean values represent 30-year average for period 1931-1960.

CIRCULATION

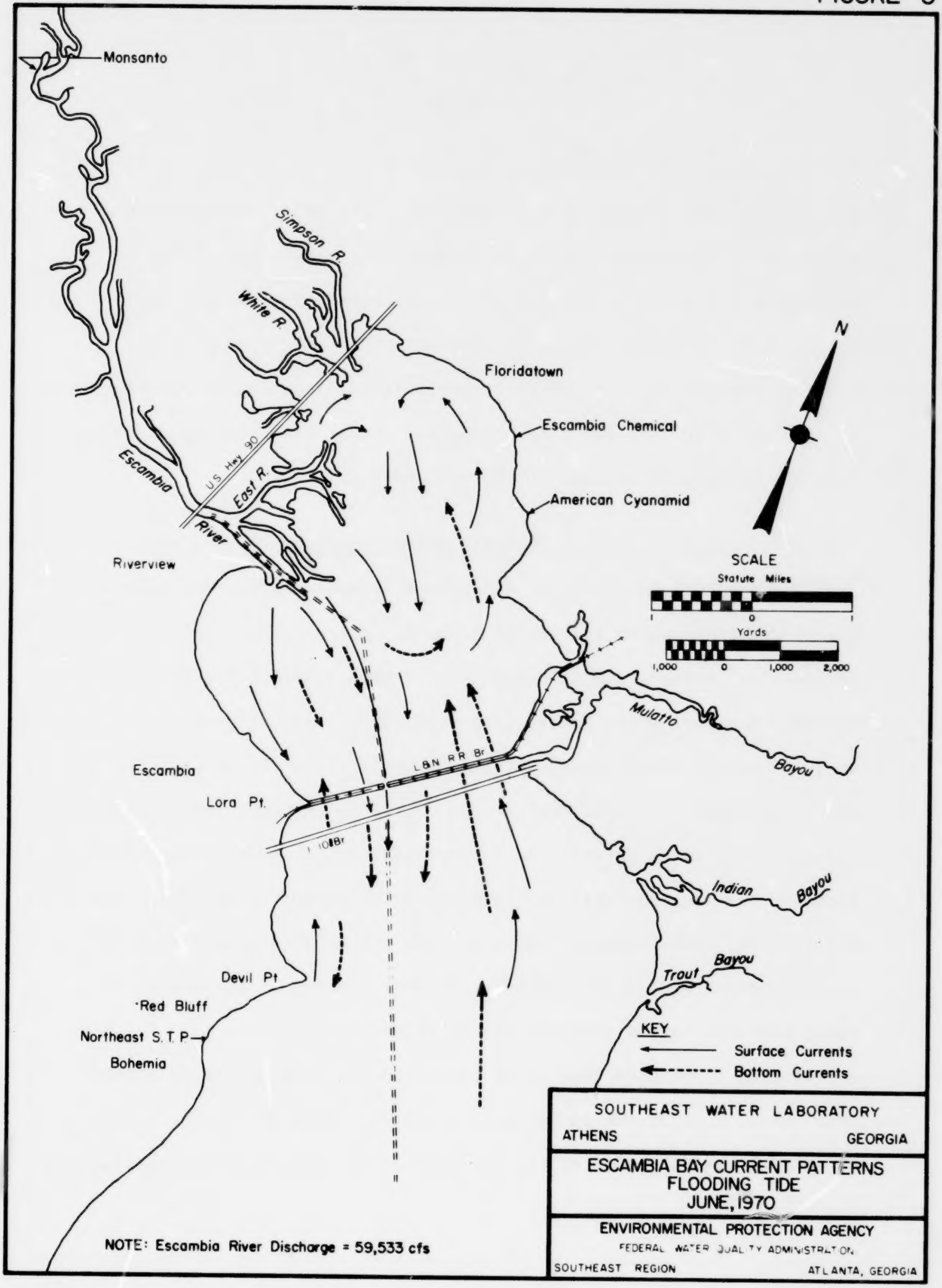
Dispersion and advection of freshwater into an estuary can be measured through the use of chloride data. The major factors affecting chloride concentrations in an estuary are: advection caused by freshwater input, and turbulent diffusion caused by tidal and wind action. The principal source of freshwater to Escambia Bay is the Escambia River. The effects of Escambia River discharge on the dispersion and advection patterns in the bay can be seen from chloride isopleths traced from synoptic chloride data.

Circulation Studies at High Escambia River Discharge (59,533 cfs)

The predominate circulation patterns in Escambia Bay for high discharge are illustrated in Figures 3 and 4. These current patterns were derived from synoptic sampling at thirty-three sampling stations in Escambia Bay during the period June 8-10, 1970. Advection during this study caused by the discharge of the Escambia River (which was near the historical peak of 77,200 cfs of April 5, 1960) was more important than dispersive or tidal forces. As a consequence, the waters of Upper Escambia Bay were essentially fresh (chloride range: 4-143 mg/l) and distinct chloride gradients necessary for accurate interpretation of current patterns were not present. However, a general picture of the upper bay circulation patterns was obtained.

During flood tide some freshwater from the Escambia River spread over the surface of the upper bay (Figure 3). Most of the freshwater moved down the bay, west of the bay centerline, approximately paralleling

FIGURE 3


Monsanto
Simpson R.
White R.
U.S. Hwy 90
Escambia River
East R.
Floridatown
Escambia Chemical
American Cyanamid
N
SCALE
Statute Miles
1
0
1
Yards
1,000
0
1,000
2,000
Riverview
Mulatto Bayou
Escambia
L&N RR Br
Lora Pt.
I 10 Br
Indian Bayou
Trout Bayou
Devil Pt
Red Bluff
Northeast S.T.P.
Bohemia
KEY
Surface Currents
Bottom Currents

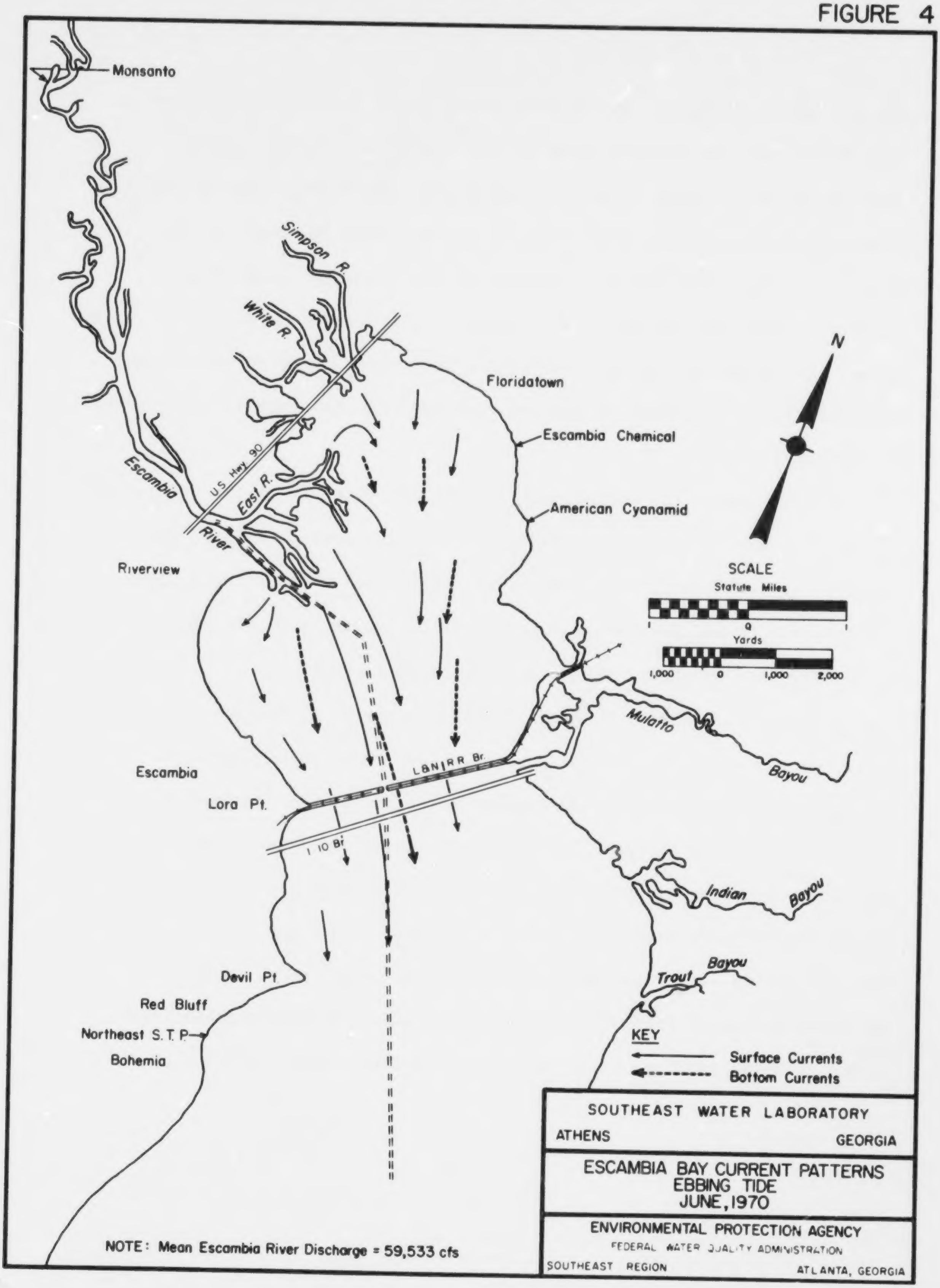
SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

ESCAMBIA BAY CURRENT PATTERNS
FLOODING TIDE
JUNE, 1970

ENVIRONMENTAL PROTECTION AGENCY
FEDERAL WATER QUALITY ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

NOTE: Escambia River Discharge = 59,533 cfs

FIGURE 4


Monsanto
Simpson R.
White R.
U.S. Hwy 90
East R.
Escambia
River
Riverview
Floridatown
Escambia Chemical
American Cyanamid
N
SCALE
Statute Miles
1
0
1
Yards
1,000
0
1,000
2,000
Mulatto
Bayou
L&N RR Br.
Escambia
Lora Pt.
I 10 Br
Indian
Bayou
Trout
Bayou
Devil Pt.
Red Bluff
Northeast S.T.P.
Bohemia
KEY
Surface Currents
Bottom Currents

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

ESCAMBIA BAY CURRENT PATTERNS
EBBING TIDE
JUNE, 1970

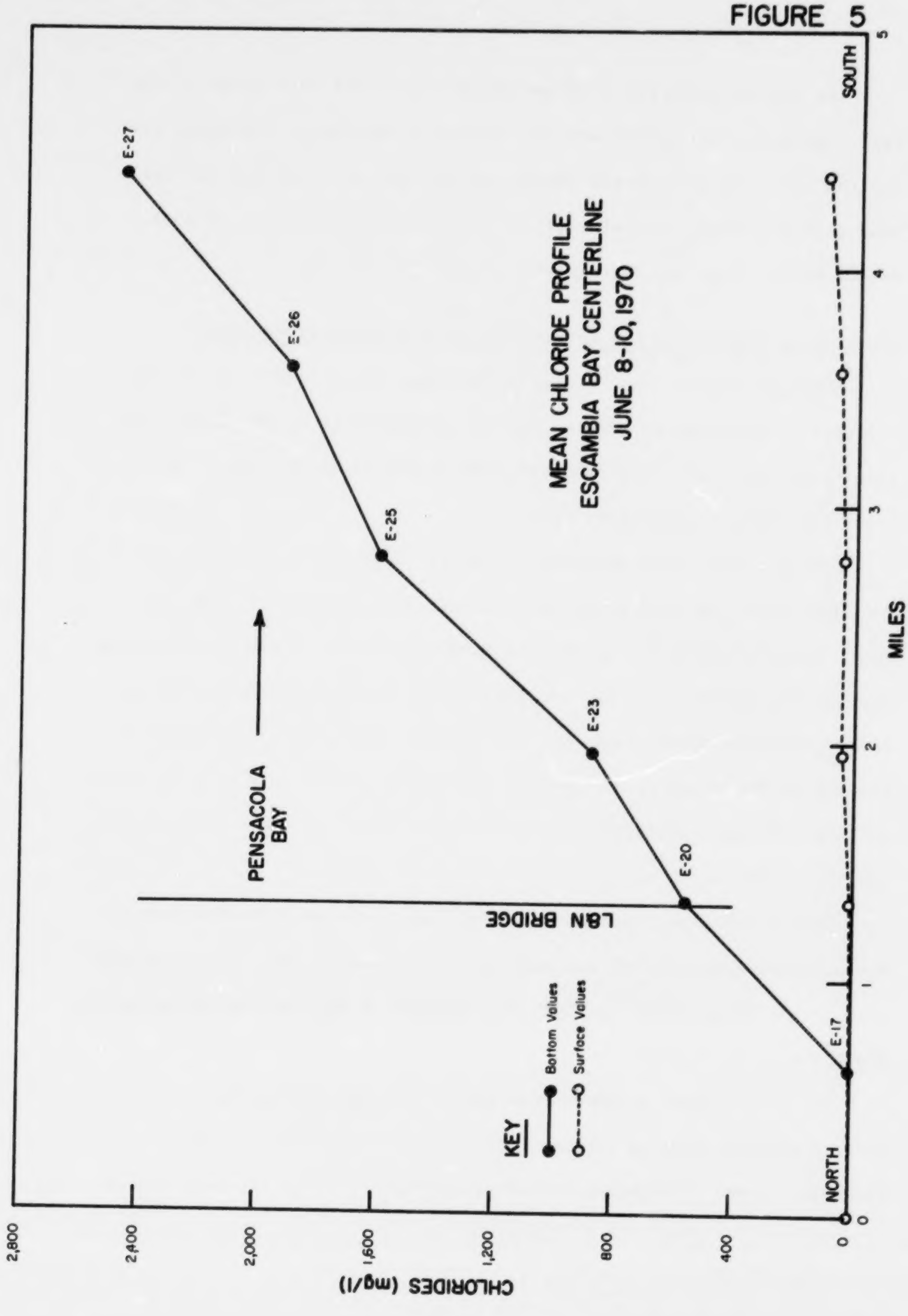
ENVIRONMENTAL PROTECTION AGENCY
FEDERAL WATER QUALITY ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

NOTE: Mean Escambia River Discharge = 59,533 cfs the navigation channel. The highest chloride values in the upper bay were found near the eastern shore in the vicinity of Mulatto Bayou. Some saline water moved up the eastern shore, apparently creating the counterclockwise surface eddy shown in the northeast quadrant of the upper bay. This eddy and the movement of the unusually large freshwater mass down the bay apparently trapped saline water in Mulatto Bayou. The principal movement of saline water took place on the bottom, moved up the eastern side of the bay as shown, and undoubtedly contributed to the eddy.

Figure 4 shows the predominate current patterns of the ebb tidal cycle. The bulk of the freshwater moved down the western half of the bay more or less parallel to the navigation channel. The highest upper bay chloride concentrations were found off the mouth of Mulatto Bayou indicating that circulation near Mulatto Bayou is poor.

The mean centerline chloride profile, Figure 5, illustrates the extent of the very low chloride concentrations which were present in the upper bay. Bottom chloride concentrations increased just south of the L&N railroad bridge. This increase could have been caused by the L&N railroad bridge hindering freshwater flushing, and blocking the inflow of saline Pensacola Bay water. However, it is just as likely, that the saline water did not intrude into the upper bay because of the sheer volume of freshwater being discharged from the Escambia River, or the chloride increase could have resulted from a combination of both conditions.

FIGURE 5


MEAN CHLORIDE PROFILE
ESCAMBIA BAY CENTERLINE
JUNE 8-10, 1970
KEY
Bottom Values
Surface Values
PENSACOLA BAY
L&N BRIDGE
E-17
E-20
E-23
E-25
E-26
E-27
NORTH
SOUTH
MILES
0
1
2
3
4
5
CHLORIDES (mg/l)
0
400
800
1,200
1,600
2,000
2,400
2,800

The lateral chloride profiles for the east and west sides of the bay, Figure 6, also illustrate the freshwater nature of the upper bay and the increase in chloride concentration just south of the L&N railroad bridge. These lateral profiles indicate the intrusion of more saline water along the eastern shore.

Circulation Studies at Low Escambia River Discharge (1068 cfs)

Chloride samples were collected 12 times synoptically at 28 sampling stations in Escambia Bay during the period September 23-25, 1969. The results of the 1969 study are described in detail in the report on that study (1) and are summarized below.

During flood tide, freshwater from the Escambia River dispersed over the upper bay toward the western shoreline (Figure 7). Saline water from Pensacola Bay moved northward along the eastern shore bottom, impeded freshwater flushing, and pushed the freshwater into the relatively stagnant marshy wetlands that characterize the northern part of the Bay in the vicinity of the U.S. 90 highway bridge. Poor circulation in this area was indicated by little variation in chloride concentration over tidal cycles.

During ebb tide, freshwater flowed south through a narrow zone on the surface, generally to the west of the bay centerline, and dispersed very little (Figure 8). Saline water receded along the bottom, primarily along the eastern shore.

The net outflow of water from the bay was generally along the western portion with intrusion of salt water on the eastern side, indicating a counterclockwise circulation pattern. Very little flushing

FIGURE 6

EAST & WEST ESCAMBIA BAY
LONGITUDINAL CHLORIDE PROFILES
JUNE 8-10, 1970

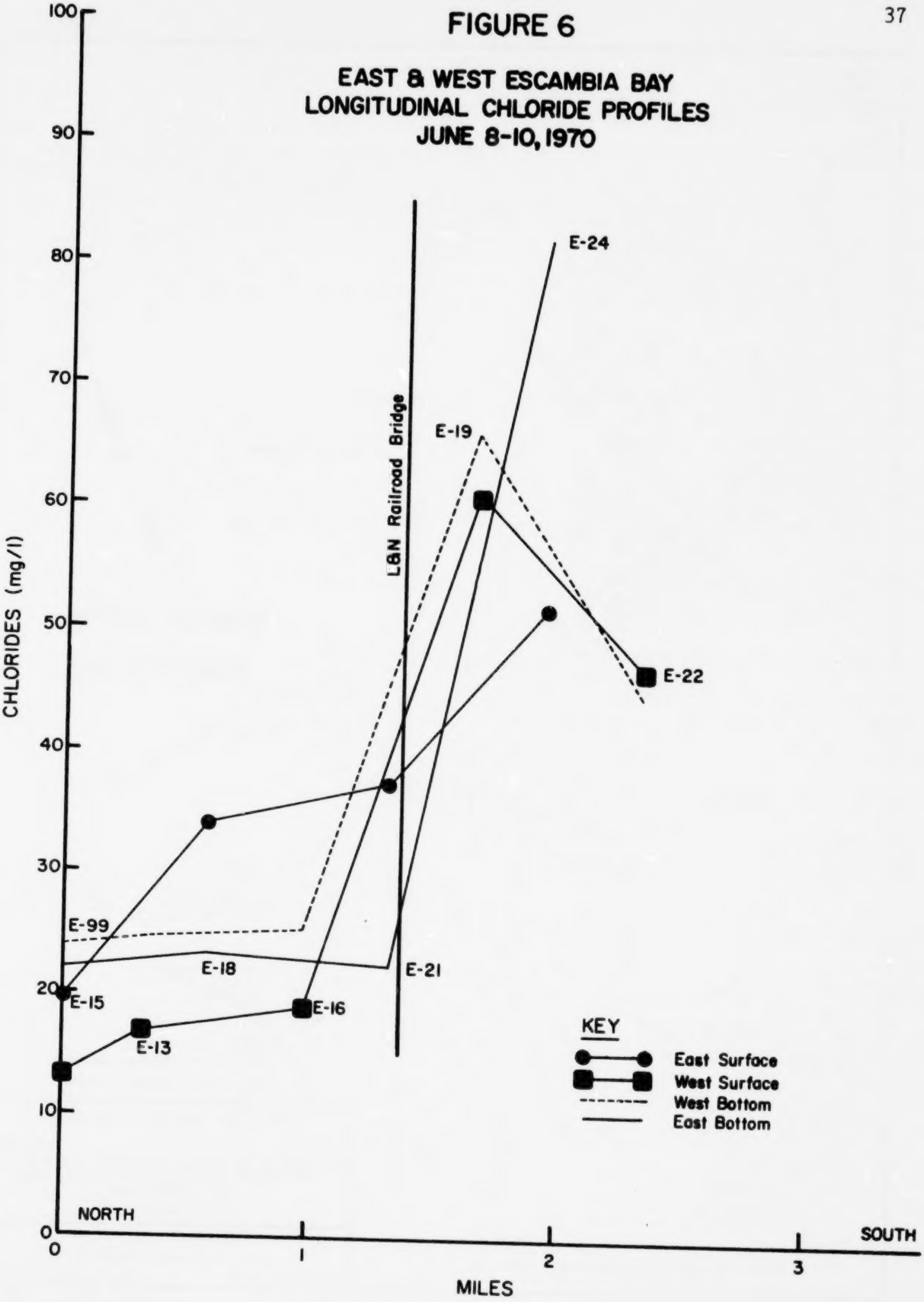
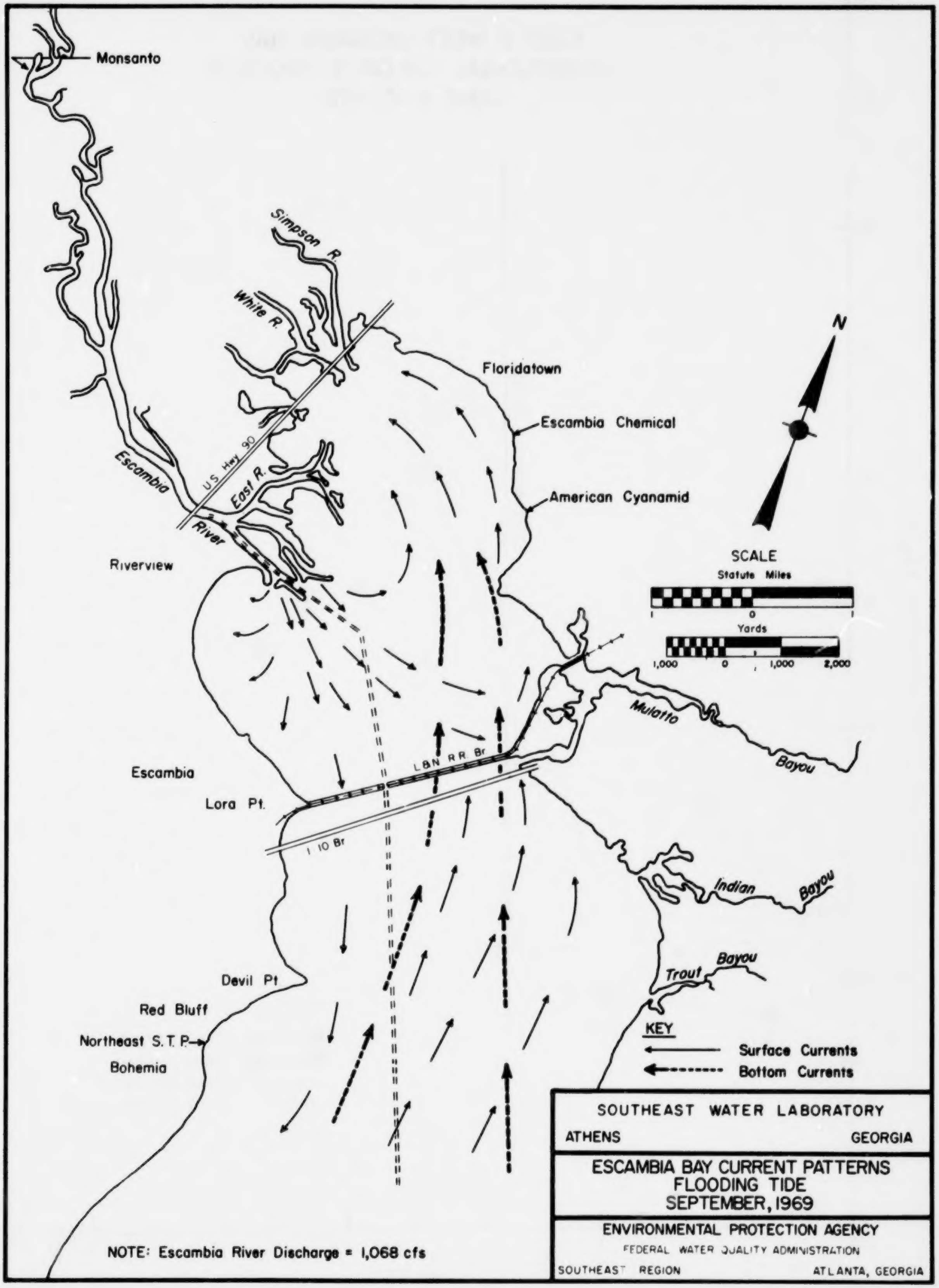


FIGURE 7


Monsanto
Simpson R.
White R.
Floridatown
Escambia Chemical
American Cyanamid
Escambia
River
U.S. Hwy. 90
East R.
Riverview
N
SCALE
Statute Miles
1
0
1
Yards
1,000
0
1,000
2,000
Mulatto
Bayou
L&N R.R. Br.
Escambia
Lora Pt.
I 10 Br.
Indian
Bayou
Trout
Bayou
Devil Pt.
Red Bluff
Northeast S.T.P.
Bohemia
KEY
Surface Currents
Bottom Currents

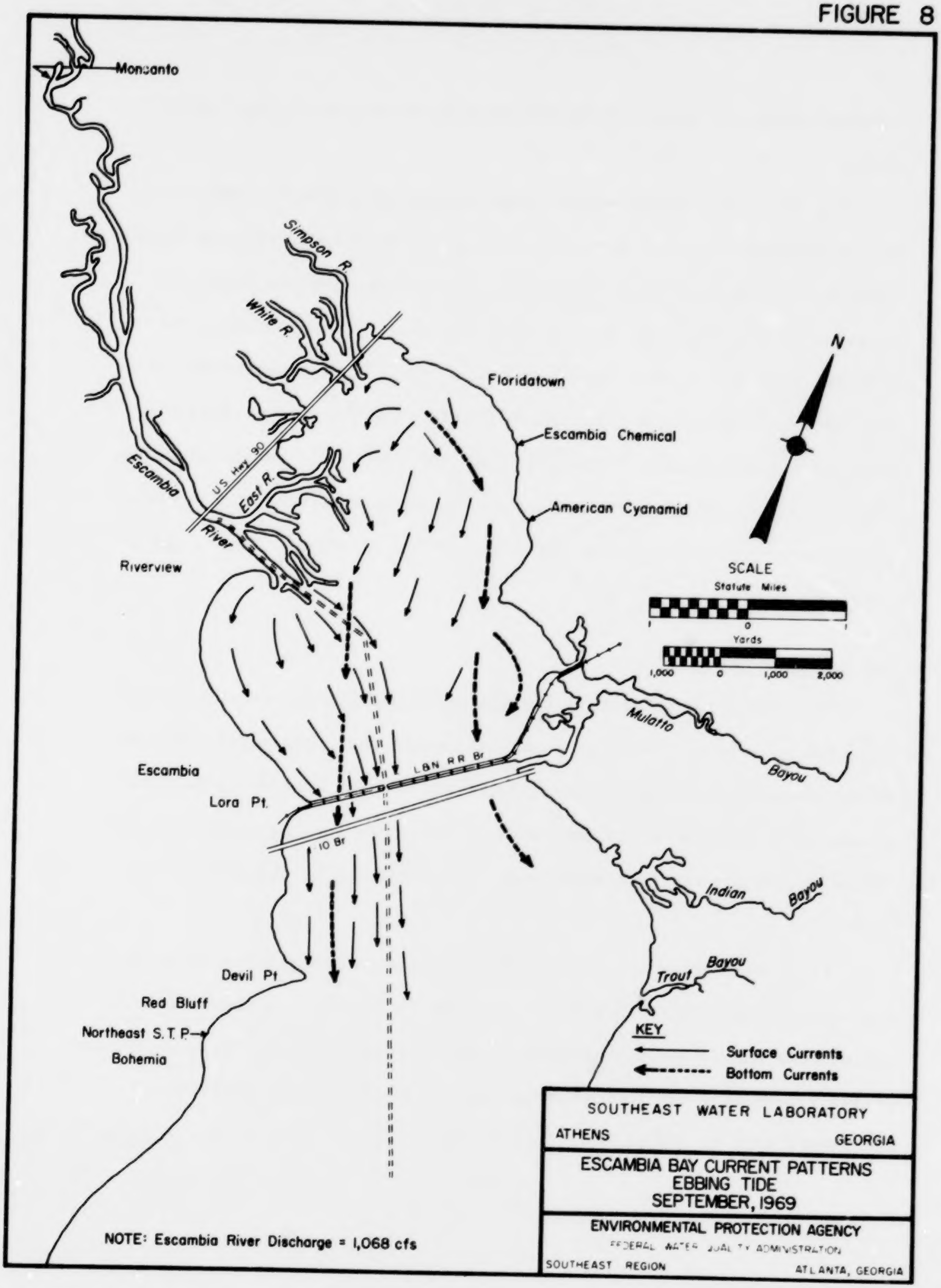
NOTE: Escambia River Discharge = 1,068 cfs

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

ESCAMBIA BAY CURRENT PATTERNS
FLOODING TIDE
SEPTEMBER, 1969

ENVIRONMENTAL PROTECTION AGENCY
FEDERAL WATER QUALITY ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

FIGURE 8


Monsanto
Simpson R.
White R.
Floridatown
Escambia Chemical
American Cyanamid
U.S. Hwy. 90
East R.
Escambia River
Riverview
N
SCALE
Statute Miles
1 0 1
Yards
1,000 0 1,000 2,000
Mulatto Bayou
LBN RR Br
Escambia
Lora Pt.
10 Br
Indian Bayou
Trout Bayou
Devil Pt.
Red Bluff
Northeast S.T.P.
Bohemia
KEY
Surface Currents
Bottom Currents

NOTE: Escambia River Discharge = 1,068 cfs

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

ESCAMBIA BAY CURRENT PATTERNS
EBBING TIDE
SEPTEMBER, 1969

ENVIRONMENTAL PROTECTION AGENCY
FEDERAL WATER QUALITY ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

occurred above the mouth of the Escambia River in the northern marsh flats.

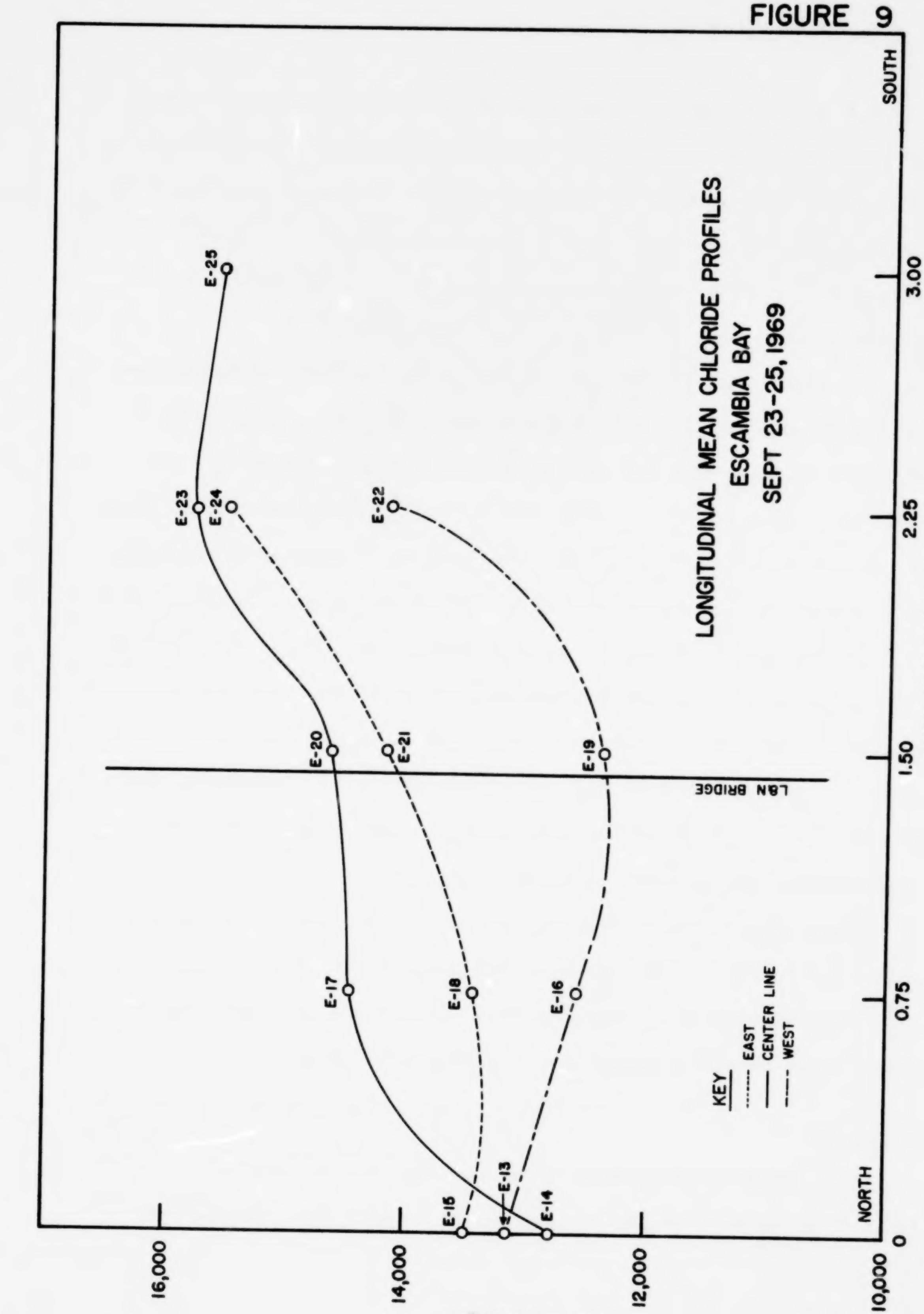
Low chloride concentrations found during the September 1969 study on the northeast side of the upper bay, north of the L&N railroad bridge (Figure 9), indicated that freshwater in the upper bay was unable to disperse to the lower bay at a significant rate. The hypothesis was proposed that the closely spaced piling of the L&N railroad bridge may contribute to restricted circulation between Upper and Lower Escambia Bay. It was postulated, therefore, that the wastes discharged above the trestle (all sources except the northeast sewage treatment plant) would remain in this section of the bay and exercise an organic demand for a long period of time.

L&N Railroad Bridge

To assess more accurately the effect of the L&N trestle on the circulation patterns of the bay, a measurement of the cross-sectional area of Escambia Bay affected by the trestle was made on June 8, 1970. The number of visible piles in the cross-section were counted and a fathometer trace of the bay cross-section immediately adjacent to the trestle was made.

Piles supporting the trestle were counted in addition to those which had been replaced but which still remained in the bay. A total of 1,149 piles with an average diameter of 12 inches were observed. This represents 1,149 square feet per foot of water depth lost because of the cross-sectional area of the piles.

FIGURE 9



LONGITUDINAL MEAN CHLORIDE PROFILES
ESCAMBIA BAY
SEPT 23-25, 1969

A fathometer trace was made immediately adjacent (within ten feet) and parallel to the south side of the trestle, within 0.2 feet of high water slack. The gross cross-sectional area of the bay at this tidal condition was 77,668 square feet, with a mean depth in the cross-section of 7.2 feet. For these conditions, 10.6% of the bay cross-section is obstructed by trestle pilings (Figure 10).

The tidal range for the cycle in which the cross-sectional measurements were made was 1.64 feet as monitored by a portable water level recorder. Tidal ranges for the period June 5-10 varied from 1.47 to 2.08 feet. In order to illustrate the effect of rising and falling tides on cross-section blockage, an arbitrary tide cycle range of 1.9 feet was picked from the tide chart. For this tidal range, an additional 0.3 feet of water was present in the bay at high water slack and 1.6 feet less at low water slack. Under these conditions, 10.6% of the cross-section was blocked for both tidal conditions. Examination of the cross-section reveals that the relative percentage blocked would not be materially changed unless water depths in the bay were decreased more than six feet--an unlikely event except under hurricane conditions.

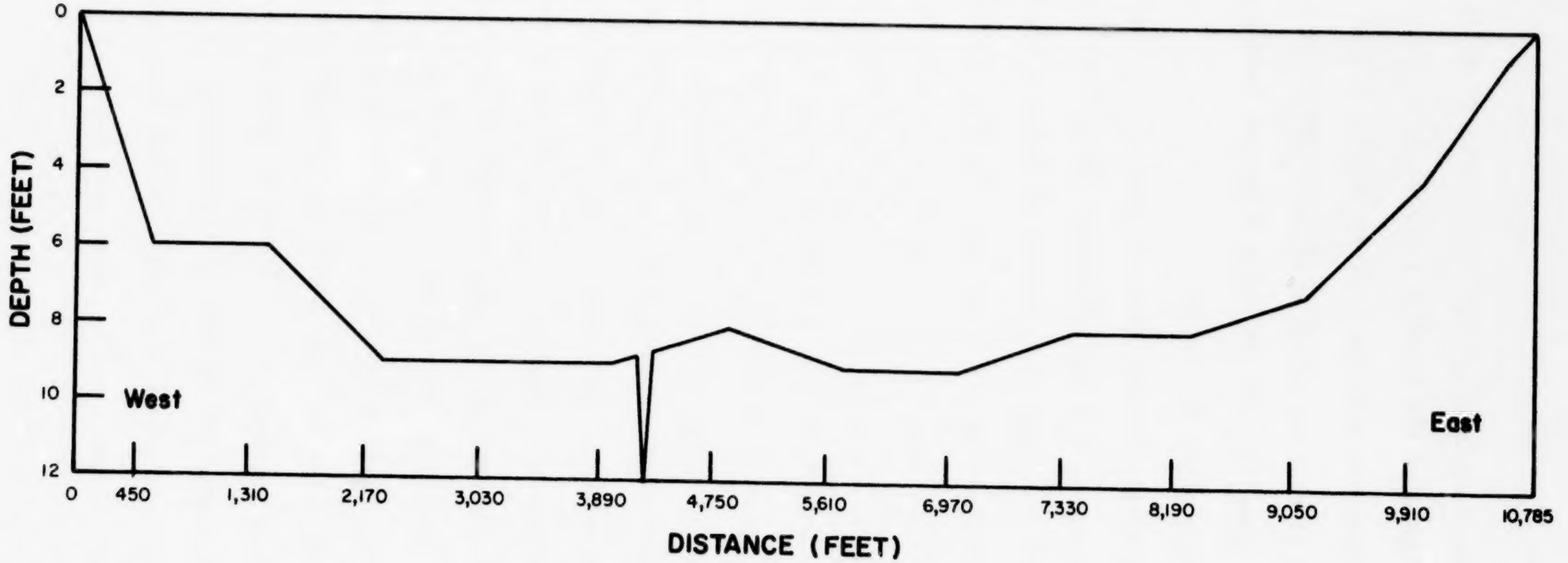
Since only visible piles were counted, it is possible that piling and/or obstructions below the water line could significantly affect the percentage of the cross-section blocked. In view of this fact, the actual cross-section blockage may be greater than 10.6%.

Discussion

Both low and high Escambia River discharge circulation studies indicate a counterclockwise circulation in Escambia Bay. During both

FIGURE 10

ESCAMBIA BAY CROSS SECTION
IMMEDIATELY NORTH OF L&N RAILROAD BRIDGE
JUNE 8, 1970



studies poor circulation was found north of Mulatto Bayou, along the eastern shore of the upper bay. Poor circulation in the northern end of the upper bay near the U.S..90 highway bridge occurred during low but not high river flows because of the quantity of fresh water discharged at high flows from the Escambia River and freshwater bleeding from the marshy area above the bridge.

The areas of poor tidal exchange in the upper bay are caused by the geometry of the bay system and the prevailing counterclockwise circulation. Escambia River discharge flows to the southeast, hindering the tidal exchange of saline water flowing northward into the upper bay, during flood tides. This condition creates a shortcircuiting effect in the upper bay, resulting in poor tidal exchange.

The effect of river discharge on bay circulation may be illustrated through a comparision of the tidal prism concept with the physical displacement time of the bay at high and low river discharge. Escambia Bay normally has one complete tidal cycle per day resulting in tidal exchange of 18.8% (the tidal prism) of the bay volume. Thus assuming complete mixing conditions, 5.3 days would be required to completely flush the bay volume by tidal exchange alone. Physical displacement time at low river flow (1068 cfs) is 92 days, at mean annual discharge (5460 cfs) is 18.0 days and at high river discharge (59,533 cfs) is 1.6 days. Thus as river discharge increases above the mean annual flow, it becomes increasingly important in exchange of bay waters.

The effect of the L&N railroad bridge on bay circulation is not clear-cut. Chloride profiles from the circulation studies show that the L&N railroad trestle causes more backwater at high Escambia River discharge than at low discharge. However, with 10.6% of the available cross-section blocked, it is doubtful that any appreciable increase in tidal flow would result from the removal of the trestle. The effects of the trestle would be minimized by removing any unnecessary piling and old construction debris as recommended by the Federal-State Enforcement Conference (2).

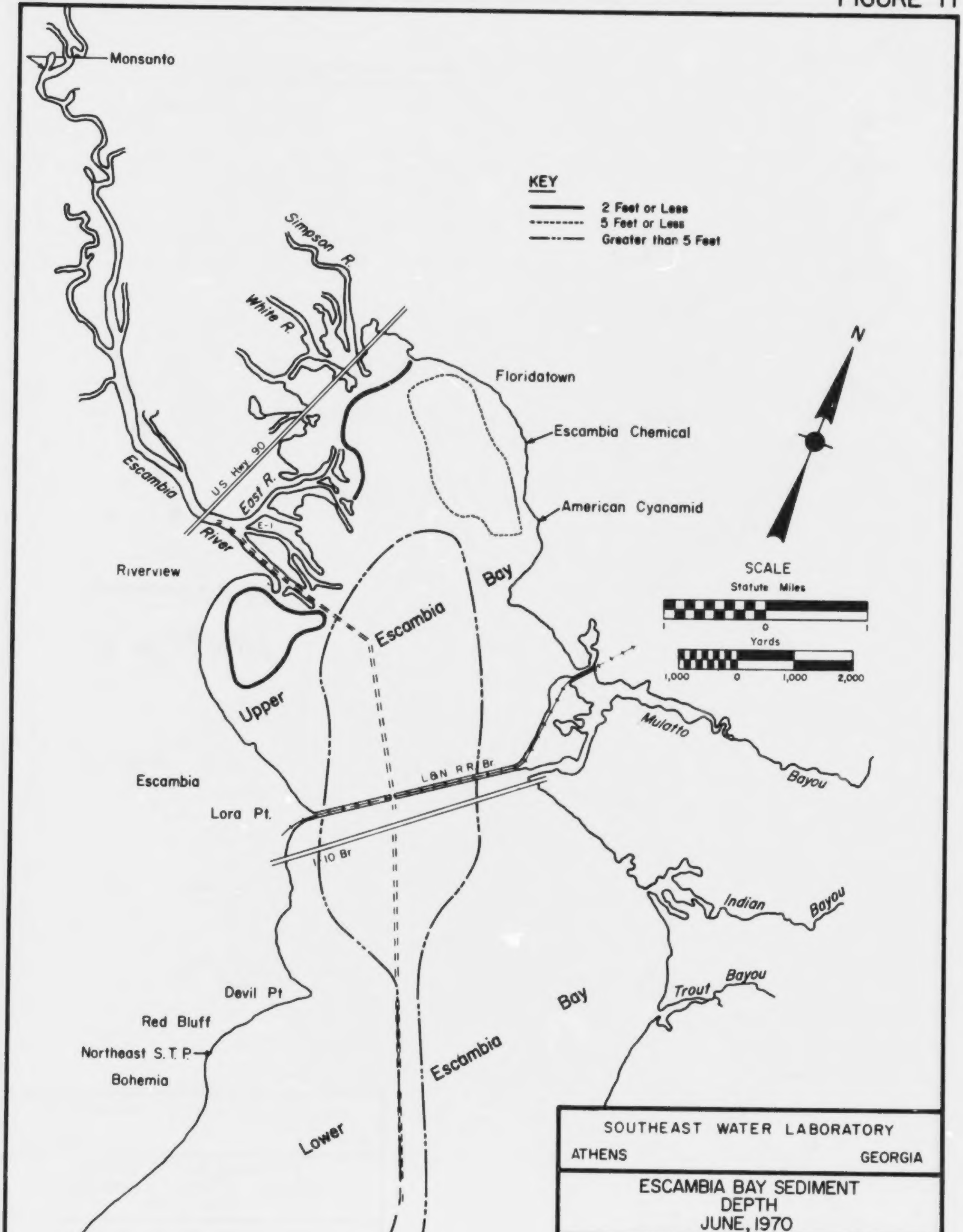
BENTHIC CHARACTERIZATION

Eighteen Escambia Bay sediment samples were collected and analyzed for organic carbon, total organic nitrogen, total phosphorus, and total oxygen demand. A record was kept of how deep sampling station markers had to be driven in the bottom sediment to achieve firm support. This crude measurement gave depths of unconsolidated sediment from two feet or less to greater than six feet (Figure 11). Approximately one-third of the upper bay was covered with sediment greater than six feet deep.

Sediment Organic Carbon Distribution

Organic carbon (O.C.) concentrations ranged from a high of 5.0% at the confluence of the Escambia and East Rivers near the mouth of the Escambia River (Station E-1), to a low of 2.3% in the southeast section of the upper bay above the L&N railroad bridge off Mulatto Bayou. (See Figure 12 for detailed data.) Organic carbon decreased southward from the highest values in and around the mouth of the Escambia River. Most of the total organic carbon (72.2%) is discharged to Escambia Bay via the Escambia River in which Monsanto and Container Corporation discharge waste. The O.C. content of the upper bay sediment increases southward to 3.5% from 1.5% at the U.S. 90 highway bridge. This increase is undoubtedly caused by the sediment load of the Escambia River and its associated waste sources and the wastes from the American Cyanamid Company. The American Cyanamid Company discharges 26.3% of the total organic carbon to the Escambia Bay system along the eastern shore of the upper bay. Another area of high O.C. (2.5% to greater than 4%) extends

FIGURE 11

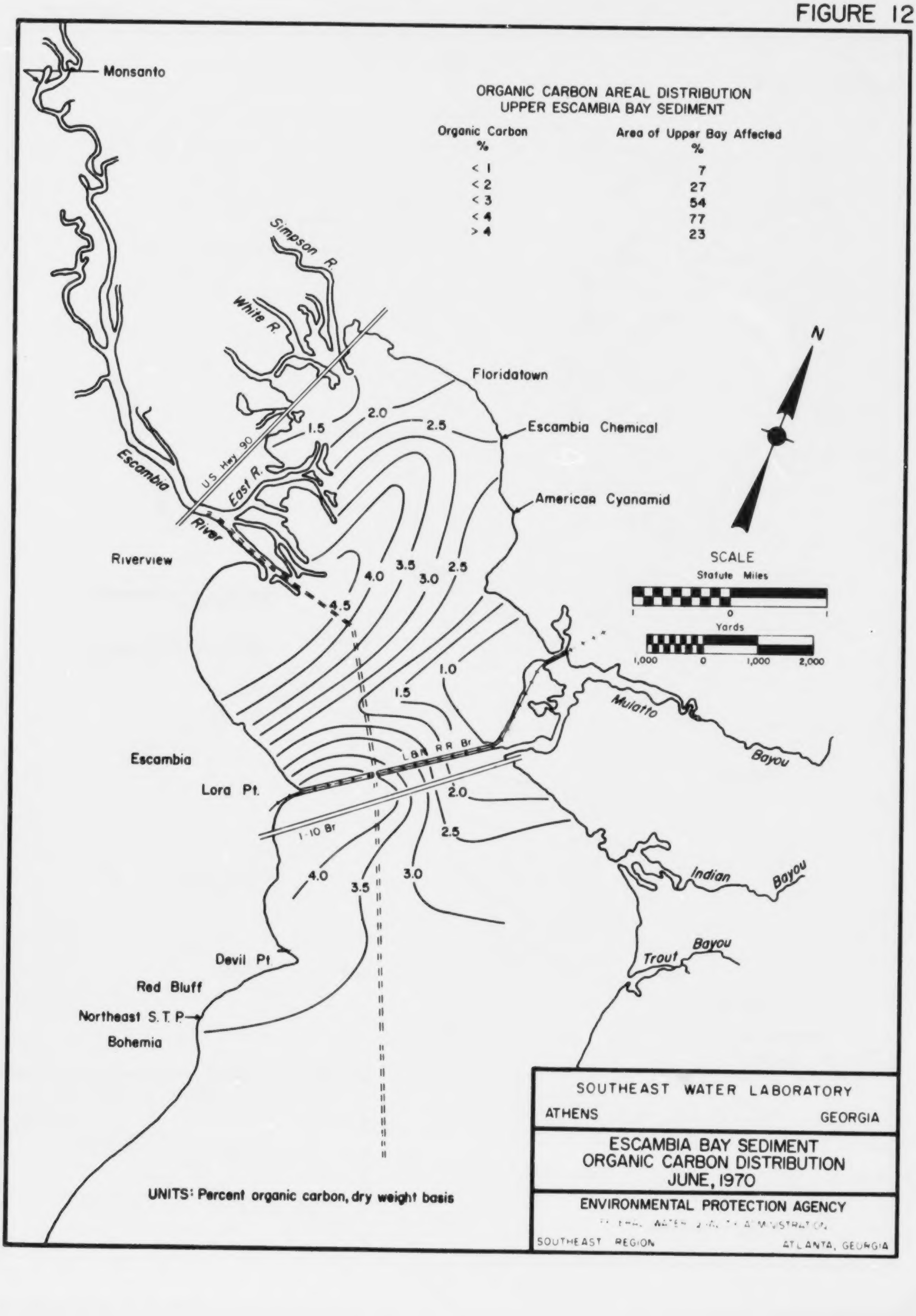

KEY
2 Feet or Less
5 Feet or Less
Greater than 5 Feet
Monsanto
Simpson R.
White R.
U.S. Hwy 90
East R.
Escambia
River
E-1
Floridatown
Escambia Chemical
American Cyanamid
N
SCALE
Statute Miles
1
0
1
Yards
1,000
0
1,000
2,000
Riverview
Bay
Escambia
Upper
Escambia
Mulatto
Bayou
L&N R.R. Br
Lora Pt.
I-10 Br
Indian
Bayou
Trout
Bayou
Devil Pt
Red Bluff
Northeast S.T.P.
Bohemia
Bay
Escambia
Lower
NOTE: Feet of Sediment

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

ESCAMBIA BAY SEDIMENT
DEPTH
JUNE, 1970

ENVIRONMENTAL PROTECTION AGENCY
FEDERAL WATER QUALITY ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

FIGURE 12


Monsanto
Simpson R.
White R.
Floridatown
Escambia Chemical
American Cyanamid
U.S. Hwy 90
East R.
Escambia River
Riverview
N
SCALE
Statute Miles
1
0
1
Yards
1,000
0
1,000
2,000
Mulatto Bayou
L&N R R Br
Escambia
Lora Pt.
I-10 Br
Indian Bayou
Trout Bayou
Devil Pt
Red Bluff
Northeast S.T.P.
Bohemia
1.5
2.0
2.5
4.0
3.5
3.0
2.5
4.5
1.0
1.5
2.0
2.5
4.0
3.5
3.0

ORGANIC CARBON AREAL DISTRIBUTION
UPPER ESCAMBIA BAY SEDIMENT

Organic Carbon %	Area of Upper Bay Affected %
< 1	7
< 2	27
< 3	54
< 4	77
> 4	23

UNITS: Percent organic carbon, dry weight basis

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

ESCAMBIA BAY SEDIMENT
ORGANIC CARBON DISTRIBUTION
JUNE, 1970

ENVIRONMENTAL PROTECTION AGENCY
FEDERAL WATER QUALITY ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

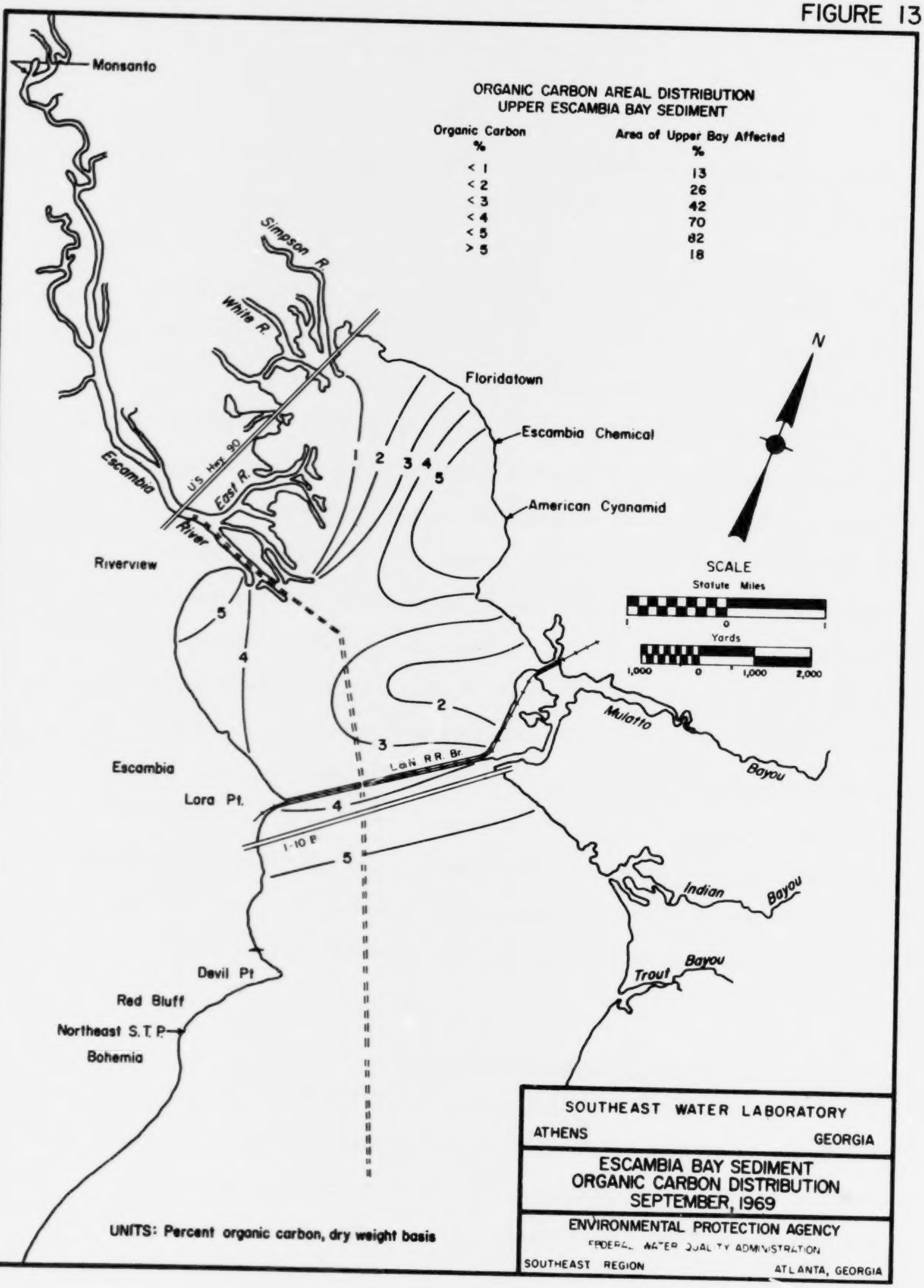
along the western shore from an area south of the L&N railroad bridge to just north of it. The O.C. concentration in this area and in the pocket along the western shore just below and west of the Escambia River are probably caused by poor circulation. A table is included at the top of Figure 12 giving the area of the upper bay covered by various concentrations of O.C. as a percentage of the upper bay area.

During the September 1969 study, sediment samples were collected at ten stations for O.C. analysis (Figure 13). The only major difference in O.C. distributions found in the two studies is that in September 1969 the highest O.C. concentrations were adjacent to the eastern shore of the upper bay near the outfalls of the American Cyanamid and Escambia Chemical companies. Except for this one exception, the two studies show very similar sediment O.C. distributions. For example, during the September 1969 study, sediment with O.C. concentrations greater than 4% was found in 29.5% of the area of the upper bay; during the June 1970 study 22.6% of this area was covered with the same concentration. It is possible that the sediment in the upper bay was rearranged during the period of high discharge of the Escambia River in June. The spatial distribution of O.C. in upper bay sediments in this study are shown at the top of Figure 13.

Sediment Total Organic Nitrogen Distribution

The highest total organic nitrogen (T.O.N.) sediment concentration, 0.27%, was located at Station E-20 in the channel, just below the L&N railroad bridge, and at Station E-1 at the confluence of the Escambia and East Rivers. The lowest concentration, 0.05%, was located off

FIGURE 13


Monsanto
Simpson R.
White R.
Floridatown
Escambia Chemical
American Cyanamid
U.S. Hwy. 90
East R.
Escambia River
Riverview
1
2
3
4
5
5
4
2
3
4
5
N
SCALE
Statute Miles
1
0
1
Yards
1,000
0
1,000
2,000
Mulatto Bayou
L&N RR. Br.
Escambia
Lora Pt.
I-10 B
Indian Bayou
Trout Bayou
Devil Pt
Red Bluff
Northeast S.T.P.
Bohemia

ORGANIC CARBON AREAL DISTRIBUTION
UPPER ESCAMBIA BAY SEDIMENT

Organic Carbon %	Area of Upper Bay Affected %
< 1	13
< 2	26
< 3	42
< 4	70
< 5	82
> 5	18

UNITS: Percent organic carbon, dry weight basis

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

ESCAMBIA BAY SEDIMENT
ORGANIC CARBON DISTRIBUTION
SEPTEMBER, 1969

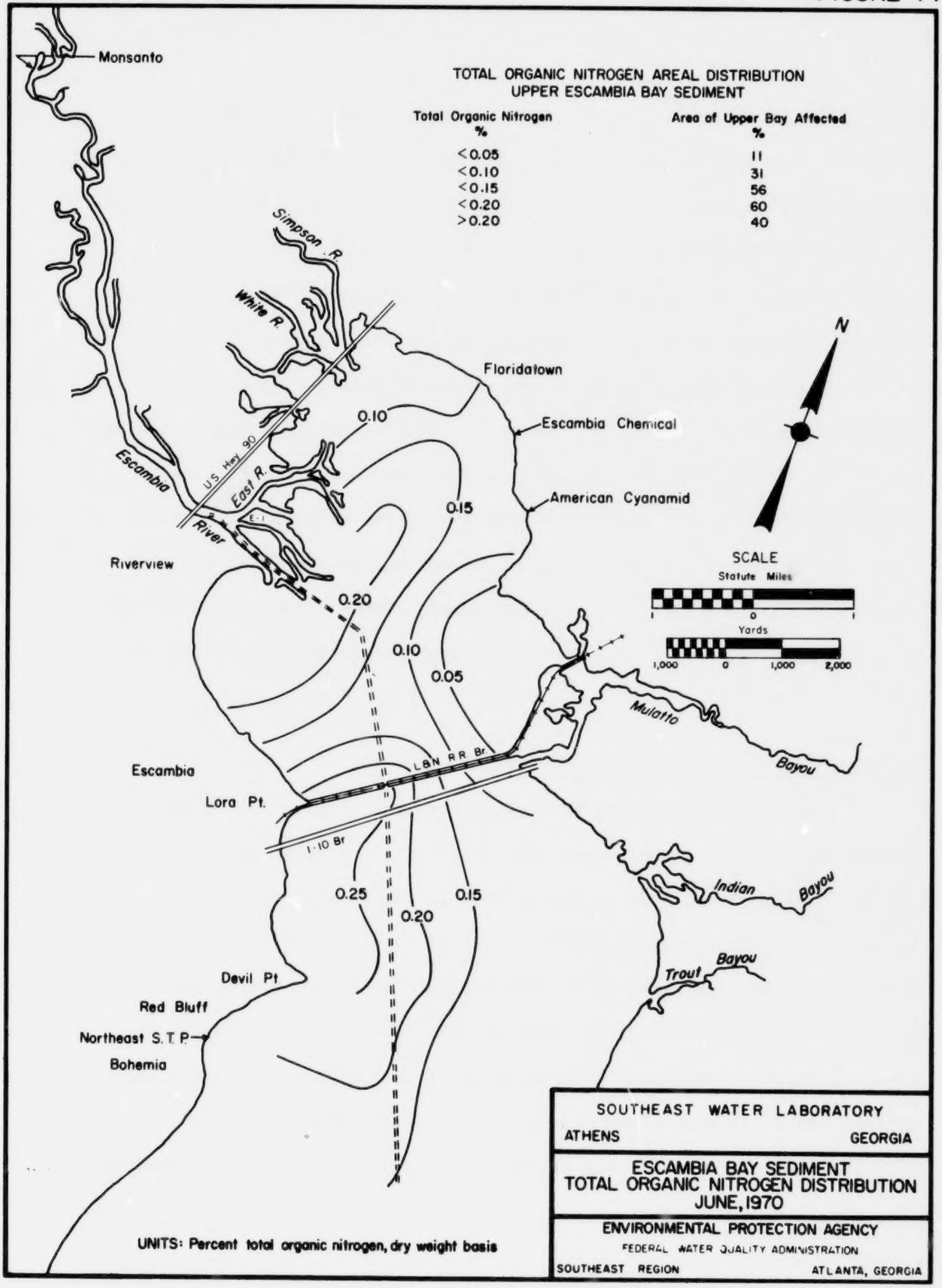
ENVIRONMENTAL PROTECTION AGENCY
FEDERAL WATER QUALITY ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

Mulatto Bayour at Station E-18. Sediment total organic nitrogen (Figure 14) decreased from greater than 0.2% at the mouth of the Escambia River to 0.05% southeastward; it decreased from 0.15% in the area of the Escambia Chemical Company to 0.10% northward; and it increased from 0.10% in the area of the U.S. 90 highway bridge to 0.15% southward. The Escambia River contributes 20.6% of the total Kjeldahl nitrogen (T.K.N.) discharged to the bay system. The Escambia and American Cyanamid Chemical Companies, located along the eastern shore of the upper bay, contribute 54.7%. An area of high sediment T.O.N. exists along the western shore of the bay, above the Northeast Sewage Treatment plant and extends from just below Devil Point to just above the L&N railroad bridge. The Northeast Sewage Treatment plant discharges 14.7% of the T.K.N. to the bay system. This area of high sediment nitrogen is probably the result of the sewage treatment plant discharge and poor circulation.

Sediment Total Phosphorus Distribution

The spatial distribution of total phosphorus (Figure 15) is very similar to the O.C. distribution (Figure 12). The highest total phosphorus concentration, 0.085%, was located at the confluence of the Escambia and East rivers at Station E-1; the lowest, 0.005%, was located at Station E-18, just west of Mulatto Bayou. The concentration gradients in the sediment are similar to those of O.C. for the same reasons. A total of 51.7% of the total phosphorus is discharged to the bay via the Escambia River (Monsanto and Container Corporation discharges), 29.1% from the American Cyanamid and Escambia Chemical plants along the eastern

FIGURE 14



TOTAL ORGANIC NITROGEN AREAL DISTRIBUTION
UPPER ESCAMBIA BAY SEDIMENT

Total Organic Nitrogen %	Area of Upper Bay Affected %
<0.05	11
<0.10	31
<0.15	56
<0.20	60
>0.20	40

Monsanto
Simpson R.
White R.
Floridatown
Escambia Chemical
American Cyanamid
U.S. Hwy. 90
East R.
Escambia
River
E-1
Riverview
0.10
0.15
0.20
0.10
0.05
N
SCALE
Statute Miles
1
0
1
Yards
1,000
0
1,000
2,000
Mulatto
Bayou
Escambia
Lora Pt.
L & N R R Br.
I-10 Br
0.25
0.20
0.15
Indian
Bayou
Trout
Bayou
Devil Pt
Red Bluff
Northeast S.T.P.
Bohemia

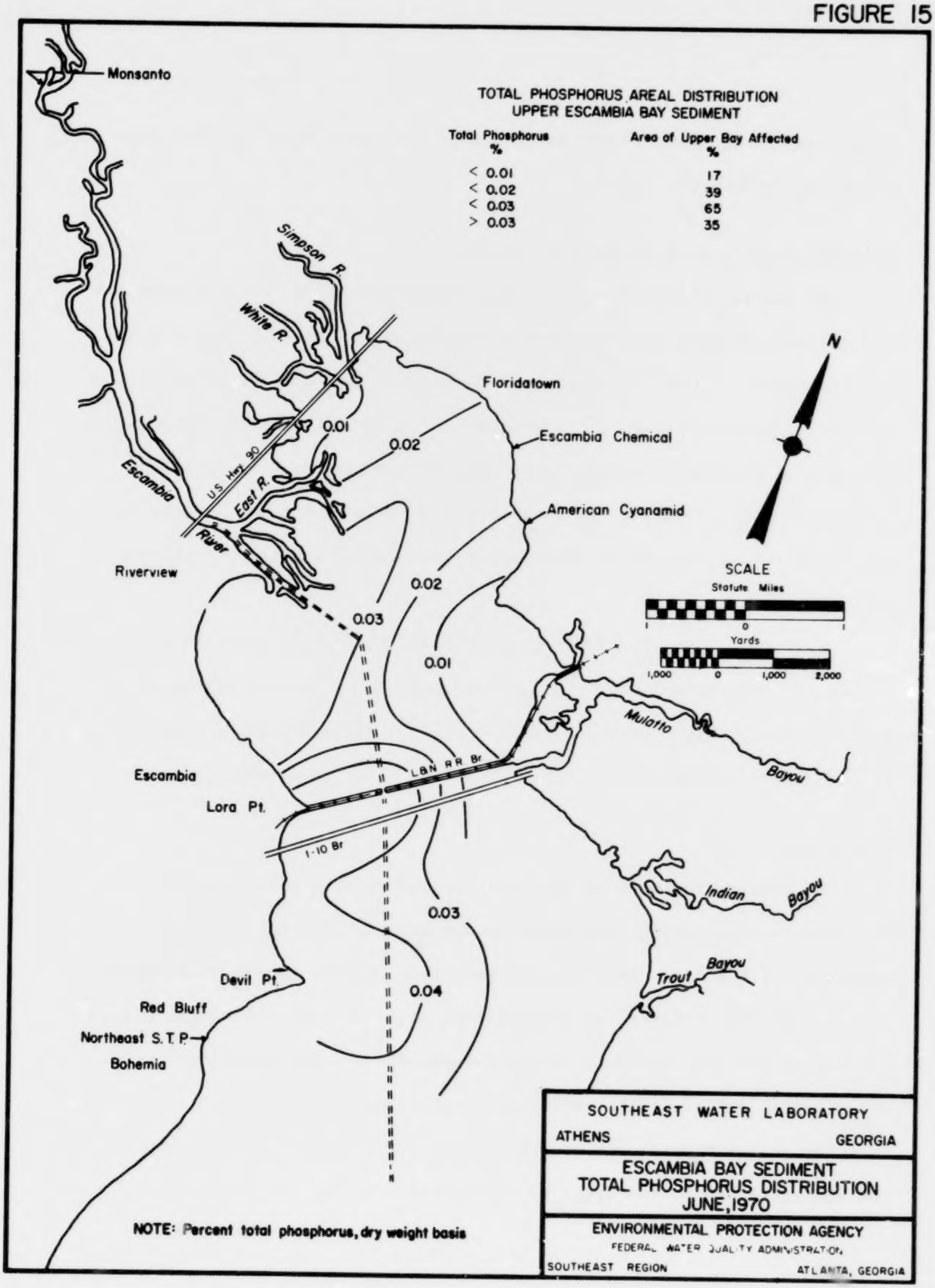
SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

ESCAMBIA BAY SEDIMENT
TOTAL ORGANIC NITROGEN DISTRIBUTION
JUNE, 1970

ENVIRONMENTAL PROTECTION AGENCY
FEDERAL WATER QUALITY ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

UNITS: Percent total organic nitrogen, dry weight basis

FIGURE 15


Monsanto
Simpson R.
White R.
U.S. Hwy 90
East R.
Escambia River
Riverview
Floridatown
Escambia Chemical
American Cyanamid
0.01
0.02
0.02
0.03
0.01
L&N RR Br
I-10 Br
Mulatto Bayou
Escambia
Lora Pt.
Indian Bayou
0.03
0.04
Trout Bayou
Devil Pt.
Red Bluff
Northeast S.T.P.
Bohemia
N
SCALE
Statute Miles
1
0
1
Yards
1,000
0
1,000
2,000

TOTAL PHOSPHORUS AREAL DISTRIBUTION
UPPER ESCAMBIA BAY SEDIMENT

Total Phosphorus %	Area of Upper Bay Affected %
< 0.01	17
< 0.02	39
< 0.03	65
> 0.03	35

NOTE: Percent total phosphorus, dry weight basis

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

ESCAMBIA BAY SEDIMENT
TOTAL PHOSPHORUS DISTRIBUTION
JUNE, 1970

ENVIRONMENTAL PROTECTION AGENCY
FEDERAL WATER QUALITY ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

shore, and 19.2% from the Northeast Sewage Treatment plant in the lower bay along the western shore.

Sediment Total Oxygen Demand Distribution

The spatial distribution of total oxygen demand (T.O.D.) in Escambia Bay sediment (Figure 16) is almost a carbon copy of the O.C. and T.O.N. distributions. T.O.D. is based on a theoretical calculation in which the organic carbon is assumed to be oxidized to carbon dioxide and the organic nitrogen to nitrate according to the following stochiometric equation: TOD = 2.67 C + 4.75 N (8). This theoretical calculation may be used as an indication of the oxygen demanding properties of a waste or sediment material.

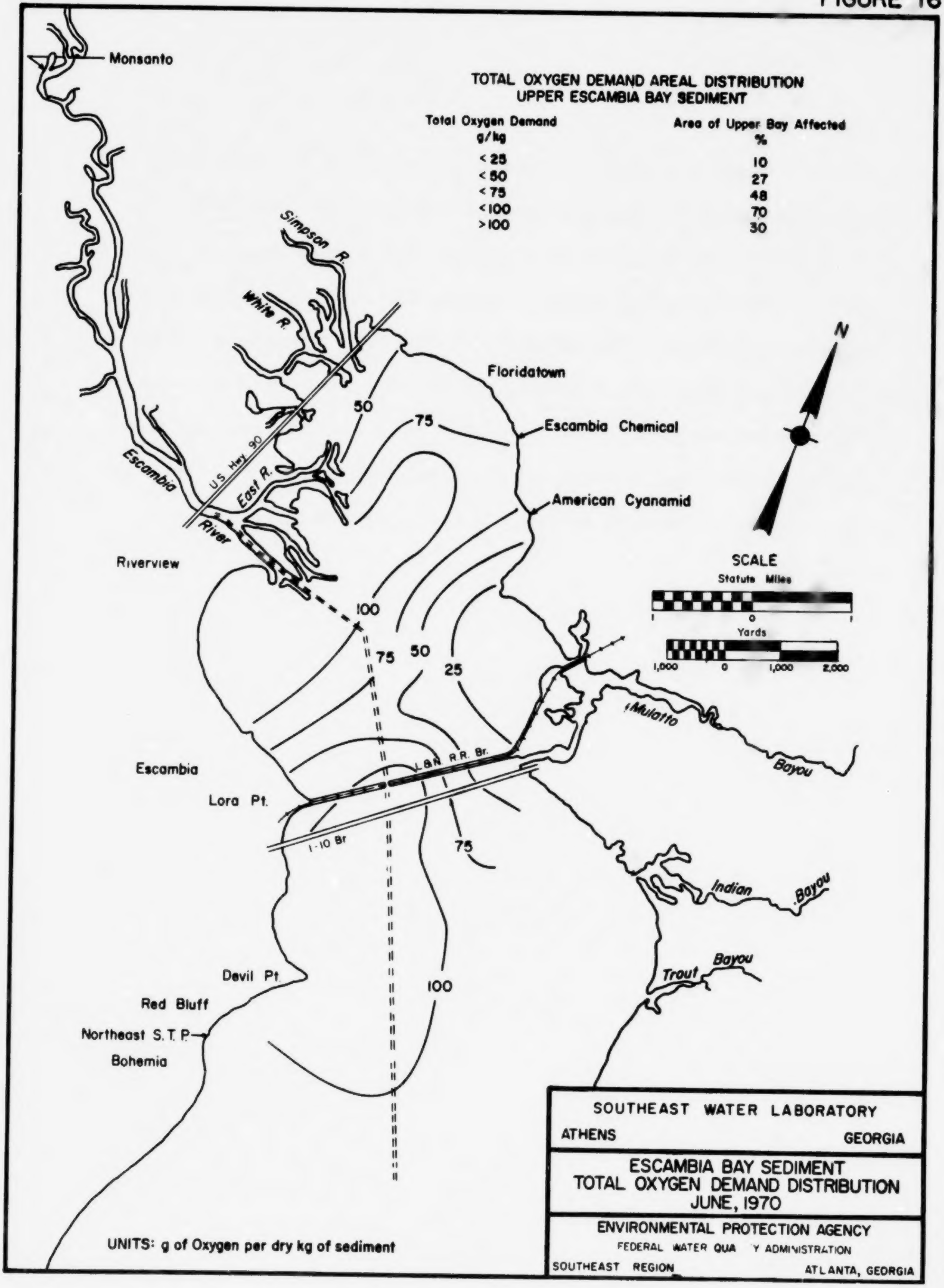
The T.O.D. spatial distribution in the upper bay is shown in a table at the top of Figure 16. A T.O.D. concentration of 100g O_2/dry KG of sediment means that theoretically 100 grams of oxygen would be required to completely oxidize (stabilize) 1 kilogram of sediment material.

Discussion

The organic sediment of Escambia Bay serves as a reservoir of nitrogenous, phosphatic, and carbonaceous material for the aquatic organisms of the bay. However, the immediate concern is the devastating effect that this material in the sediment could have on the oxygen resources of the bay should it become resuspended through dredging, or other means, and exert its potential oxygen demand.

The sediment of lowest organic carbon content was located along the eastern shore of the upper bay off Mulatto Bayou; the sediment

FIGURE 16


Monsanto
Simpson R.
White R.
U.S. Hwy. 90
East R.
Escambia River
Floridatown
Escambia Chemical
American Cyanamid
Riverview
N
SCALE
Statute Miles
1 0 1
Yards
1,000 0 1,000 2,000
Mulatto Bayou
L&N R.R. Br.
I-10 Br
Escambia
Lora Pt.
Indian Bayou
Trout Bayou
Devil Pt.
Red Bluff
Northeast S.T.P.
Bohemia
50
75
100
75
50
25
75
100

TOTAL OXYGEN DEMAND AREAL DISTRIBUTION
UPPER ESCAMBIA BAY SEDIMENT

Total Oxygen Demand g/kg	Area of Upper Bay Affected %
< 25	10
< 50	27
< 75	48
< 100	70
> 100	30

UNITS: g of Oxygen per dry kg of sediment

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

ESCAMBIA BAY SEDIMENT
TOTAL OXYGEN DEMAND DISTRIBUTION
JUNE, 1970

ENVIRONMENTAL PROTECTION AGENCY
FEDERAL WATER QUALITY ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

highest in organic carbon content was located off the mouth of the Escambia River and west of center of the upper and lower bays. The location and character of these sediment deposits support the chloride circulation study conclusions regarding the counter-clockwise nature of bay circulation. The wastes discharged along the eastern shore (American Cyanamid and Escambia Chemical) are swept westward and are deposited along with wastes (primarily those from Monsanto and Container Corporation) and the sediment load from the Escambia River in the central and western portions of the upper and lower bays.

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APPENDICES

APPENDICES

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II	Sampling Procedures and Analytical Methods	24
III	Chloride Data Summary	28,29
IV	Sediment Analytical Data Summary	30
V	Sampling Station Locations	31,32

APPENDIX I

PROJECT PERSONNEL

Escambia Bay Study
June 8-10, 1970

Name	Title
M. D. Lair	Sanitary Engineer
Dennis T. Cafaro	Sanitary Engineer
L. W. Olinger	Sanitary Engineer
P. L. Wagner	Sanitary Engineer
T. Bennett	Project Chemist
R. T. Wilkerson	Technician
R. A. Wiemert	Technician
H. C. Vick	Technician
M. R. Weldon	Aquatic Biologist
C. M. Swinford	Technician
T. P. Gallagher	Sanitary Engineer

APPENDIX II

SAMPLING PROCEDURES AND ANALYTICAL METHODS

Escambia Bay Study

June 8-10, 1970

1) PROCEDURES

The Escambia Bay field survey was conducted from noon on June 8 to noon on June 10, 1970. Thirty-five sampling stations were located in the field by compass-bearing techniques. Twenty-eight of these stations, E-1 through E-28, were used on the previous Escambia Bay study. These sampling stations are shown on the fold-out map at the rear of this report and the geographic locations are given in Appendix V.

a) Chloride Circulation Study

Chloride sampling runs were made every four hours around the clock for a total of 12 complete runs.

Samples were collected with Kemmerer samplers at one foot below the surface (surface sample), one foot above the bottom (bottom sample) and at mid-depth according to the following schedule:

Water Depth	Sampling Depth
0-3 feet	mid-depth
3-6 feet	surface and bottom
over 6 feet	surface, mid-depth and bottom

Samples were collected in plastic bottles and returned to the Southeast Water Laboratory for analysis.

Samples were collected at 33 locations. One station was located at the confluence of the Escambia and East Rivers (E-1), two in Mulatto Bayou (M-1 and M-2), 20 in upper Escambia Bay (E-2 through E-18, E-36, E-59 and E-99) and 10 in the lower Escambia Bay (E-19 through E-28).

b) Sediment Characterization

Eighteen sediment samples were collected from Escambia Bay for chemical characterization during the study. These samples were collected on the chloride sampling runs as time permitted. Samples were collected at the following sample locations: E-1, E-2, E-3, E-6, E-7, E-9, E-10, E-13, E-15, E-16, E-18, E-20, E-22, E-24, E-25, E-27, EB-1, EB-2.

Sediment samples were collected with a Peterson dredge, stored in plastic containers and returned to the Southeast Water Laboratory for analysis. The samples were analyzed for organic carbon, organic nitrogen and total phosphorus.

2) ANALYTICAL METHODS

a) Circulation Study

Chloride

Reference: Automated Ferricyanide Method, FWQA Methods for Chemical Analysis of Water and Wastes, November 1969.

Thiocyanante ion is liberated from mercuric thiocyanate by sequestering mercury with chloride ion to form unionized mercuric chloride. In the presence of ferric ion, the liberated thiocyanate forms highly colored ferric thiocyanate, whose concentration (color) is proportional to the original chloride concentration.

b) Sediment Characterization Study

- Pre-treatment

All sediment samples were oven dried overnight at 103°C. The samples were then ground and aliquot portions were used for chemical analysis.

- Chemical Oxygen Demand (COD)

Reference: Chemical Oxygen Demand Method, FWQA Methods for Chemical Analysis of Water and Wastes, November 1969.

Organic materials are oxidized by potassium dichromate solution in 50% sulfuric acid. The excess dichromate is titrated with standard ferrous ammonium sulfate using ferroin indicator. The amount of dichromate used in the oxidation is proportional to the amount of organic and oxidizable inorganic matter in the sample.

- Total Organic Nitrogen (TON)

References: Bottom Sediments, Chemistry Laboratory Manual, Great Lakes Region, FWQA, 1969. Automated Alkaline Hypochlorite Dried Procedure for Phosphorus, FWQA, Methods for Chemical Analysis of Water and Wastes, November 1969.

Sediment samples were manually digested by the referenced Great Lakes procedure and distilled. The ammonia was determined by the automated alkaline hypochlorite procedure.

- Total Phosphorus

References: Automated Ascorbic Acid Method, FWQA, Methods for Chemical Analysis of Water and Wastes, November 1969. Dried sediment samples were manually digested with acid persulfate.

Phosphorus is reacted with ammonium molybdate complex. This complex is reduced to an intensely blue colored complex by ascorbic acid. The color is proportional to the phosphorus concentration.

APPENDIX III

CHLORIDE DATA SUMMARY JUNE 8-10, 1970

Run	Date June 1970	Beg. Time of Run	End. Time of Run	Depth*	E-1	E-2	E-3	E-4	E-5	E-6	E-7	E-8	E-9	E-10	E-11	E-12	E-13	E-14	E-15	E-16	E-17
					CHLORIDE CONCENTRATIONS (mg/l)																
1	8	1325	1530	S	<10	11	11	14	12	11	12	11	10	11	13	10	23	11	11	13	15
				M	<10	-	-	-	-	11	-	-	11	12	-	-	20	11	-	18	16
				B	<10	11	15	30	12	14	44	12	45	23	19	28	34	16	20	39	17
2	8	1655	1950	S	10	10	10	23	10	12	21	17	12	11	29	26	18	13	27	19	17
				M	10	-	-	-	-	-	-	-	24	11	-	-	28	17	-	-	-
				B	10	10	11	12	12	18	23	26	27	18	48	33	58	20	30	45	18
3	8-9	2140	0105	S	10	10	-	68	-	11	54	21	11	16	-	24	20	30	19	18	16
				M	10	-	11	-	12	-	-	-	-	-	36	-	-	12	-	-	-
				B	10	12	-	30	-	13	56	22	14	14	-	22	33	14	20	-	16
4	9	0135	0335	S	6	-	-	-	-	11	17	-	10	18	32	24	16	16	-	23	12
				M	6	7	7	16	9	-	-	13	-	19	-	-	-	-	22	-	-
				B	12	-	-	-	-	12	17	-	12	19	35	28	14	16	-	27	12
5	9	0502	0612	S	5	-	-	-	-	12	18	-	10	13	-	25	12	12	-	22	10
				M	5	7	8	15	7	-	-	12	-	-	42	-	-	-	23	-	-
				B	9	-	-	-	-	14	19	-	11	14	-	25	12	13	-	23	12
6	9	0835	0949	S	5	-	-	-	-	11	45	-	10	13	-	25	14	9	-	24	10
				M	5	7	9	17	8	-	-	14	-	-	47	-	-	-	21	-	13
				B	5	-	-	-	-	13	29	-	11	13	-	29	15	13	-	24	14
7	9	1300	1505	S	<10	-	12	23	12	12	25	11	18	11	19	31	16	12	11	27	12
				M	10	17	-	-	-	12	-	-	-	-	-	-	-	13	-	-	-
				B	10	-	12	25	13	19	101	13	14	13	26	20	37	17	24	26	12
8	9	1645	1815	S	10	-	-	28	-	11	49	13	15	12	32	15	18	12	22	16	14
				M	10	12	11	-	10	11	-	-	18	-	-	-	-	13	-	-	-
				B	12	-	-	49	-	19	28	16	25	18	68	22	21	52	24	15	15
9	9	2130	2335	S	<10	-	-	-	-	12	-	15	13	14	28	15	24	20	22	14	24
				M	<10	10	32	125	15	12	73	-	13	14	-	-	-	-	-	-	-
				B	<10	-	-	-	-	12	-	14	12	16	56	26	24	17	22	15	23
10	10	0100	0215	S	5	-	-	-	-	13	43	18	9	45	-	18	13	17	-	12	15
				M	5	8	8	85	6	-	-	-	-	-	39	-	-	-	19	-	14
				B	5	-	-	-	-	13	16	17	9	16	-	24	15	17	-	28	18
11	10	0505	0618	S	5	-	-	-	-	30	-	18	8	29	-	22	13	11	-	19	11
				M	6	7	7	27	16	-	26	-	-	-	30	-	-	-	19	-	11
				B	5	-	-	-	-	13	-	12	10	17	-	26	12	12	-	24	12
12	10	0838	1035	S	5	-	-	-	-	10	-	13	9	26	-	25	20	11	-	17	11
				M	4	7	7	26	13	-	38	-	-	-	23	-	-	-	21	-	12
				B	5	-	-	-	-	12	-	20	10	18	-	40	19	12	-	17	12

*Surface samples were taken at one foot depth - bottom samples one foot from the bottom.

APPENDIX III (contd)

CHLORIDE DATA SUMMARY JUNE 8-10, 1970

Run	Date June 1970	Beg. Time of Run	End. Time of Run	Depth*	CHLORIDE CONCENTRATION (mg/l) E-18	E-19	E-20	E-21	E-22	E-23	E-24	E-25	E-26	E-27	E-28	E-36	E-59	E-99	M-1	M-2
1	8	1325	1530	S	15	74	-	17	28	38	222	19	96	278	218	10	10	10	49	247
				M	15	72	83	25	30	81	450	40	330	415	760	12	-	-	-	247
				B	20	71	5800	42	31	6100	560	6000	6700	5750	8700	13	10	13	72	234
2	8	1655	1950	S	21	35	72	19	92	88	65	189	135	211	390	11	11	19	153	194
				M	-	-	93	-	100	104	-	253	170	243	420	-	-	-	-	-
				B	30	35	320	21	84	725	118	4400	5250	4950	4300	12	12	137	240	210
3	8-9	2140	0105	S	23		16	19		224	36	64	66	193	88	11	-	-	-	-
				M	-	-	22	-	-	210	-	283	111	149	115	-	12	11	160	-
				B	20	-	62	19	-	300	37	550	1550	258	2300	11	-	-	-	-
4	9	0135	0335	S	21	52	10	16	44	19	26	22	73	34	72	11	-	-	-	-
				M	-	-	12	-	-	22	-	20	112	35	112	-	7	14	-	-
				B	22	52	11	16	57	145	26	120	390	690	6650	12	-	-	-	-
5	9	0502	0612	S	23	58	<10	238	38	12	23	23	93	51	54	11	-	-	-	-
				M	-	-	-	-	-	13	-	20	97	50	5200	-	8	15	-	-
				B	24	58	10	22	39	12	24	44	272	1550	-	11	-	-	-	-
6	9	0835	0949	S	22	47	<10	21	31	12	42	21	69	66	66	11	-	-	-	-
				M	-	-	14	-	-	12	-	22	130	264	75	-	6	7	-	-
				B	19	128	465	18	42	1550	27	450	1530	4600	6200	12	-	-	-	-
7	9	1300	1505	S	16	75	12	15	29	12	24	22	58	157	168	12	10	10	57	151
				M	-	-	12	-	30	14	-	34	167	245	310	-	-	-	-	-
				B	32	86	16	20	28	655	31	3750	3600	2850	5500	14	11	18	70	149
8	9	1645	1815	S	14	116	16	20	76	16	24	30	28	113	278	14	12	13	76	167
				M	-	-	16	-	75	18	-	33	32	112	300	-	-	-	-	-
				B	13	95	15	23	50	42	28	3400	1850	3550	7400	14	13	15	76	180
9	9	2130	2335	S	20	49	14	19	46	28	84	27	47	47	73	10	-	<10	-	-
				M	-	-	14	-	-	28	-	27	57	55	82	-	<10	-	-	-
				B	20	47	14	20	46	28	60	46	1090	1490	2450	11	-	<10	-	-
10	10	0100	0215	S	47	50	<10	19	42	11	21	26	27	30	98	11	-	-	-	-
				M	-	-	<10	-	-	19	-	29	28	33	98	-	11	33	-	-
				B	28	51	<10	18	42	-	23	10	290	50	4200	11	-	-	-	-
11	10	0505	0618	S	143	41	10	21	46	10	27	18	74	29	145	9	-	-	75	150
				M	-	-	10	-	-	<10	-	16	139	26	80	-	7	8	-	152
				B	26	40	11	23	46	10	21	400	300	271	4950	10	-	-	-	158
12	10	0838	1035	S	43	76	10	22	40	10	24	14	25	144	142	9	-	-	74	142
				M	-	-	10	-	-	12	-	13	30	96	140	-	7	7	-	150
				B	26	67	12	25	22	12	24	36	182	3550	4150	10	-	-	75	170

*Surface samples were taken at one foot depth - bottom samples one foot from the bottom.

APPENDIX IV

SEDIMENT ANALYTICAL DATA SUMMARY

Escambia Bay Study

June 8-10, 1970

Station Number	Date (1970) June	Chemical Oxygen Demand (mg/kg)	Total Phosphorus (mg/kg)	Total Organic Carbon[1] (mg/kg)	Total Oxygen Demand[2] (g/kg)
E-1	9	32,500	850	49,625	146.4
E-2	10	30,100	85	11,273	32.8
E-3	9	49,000	142	18,352	53.1
E-6	10	105,000	275	39,326	114.6
E-7	9	70,200	288	26,292	76.3
E-9	9	122,500	370	45,880	134.3
E-10	10	88,000	208	32,959	96.4
E-13	10	126,100	388	47,228	138.0
E-15	9	6,200	55	2,322	7.6
E-16	9	65,200	288	24,419	71.6
E-18	9	13,900	50	5,206	15.2
E-20	9	125,700	550	47,079	139.8
E-22	9	110,000	400	41,198	122.8
E-24	9	66,800	215	25,019	73.8
E-25	9	92,500	455	34,644	105.6
E-27	9	89,700	325	33,596	97.8
EB-1	9	82,200	262	30,787	89.1
EB-2	9	89,100	362	33,370	98.5

---

[1] Calculated stoichiometrically from the chemical oxygen demand analysis from the chemical reaction: $C + O_2 \longrightarrow CO_2$.

[2] Total Oxygen Demand = 2.67 organic carbon + 4.57 organic nitrogen. Reference: Department of Scientific and Industrial Research, "Effects of Polluting Discharges on the Thames Estuary." Water Poll. Res. Tech. Paper No. II, Her Majesty's Stationery Office, London (1964).

APPENDIX V

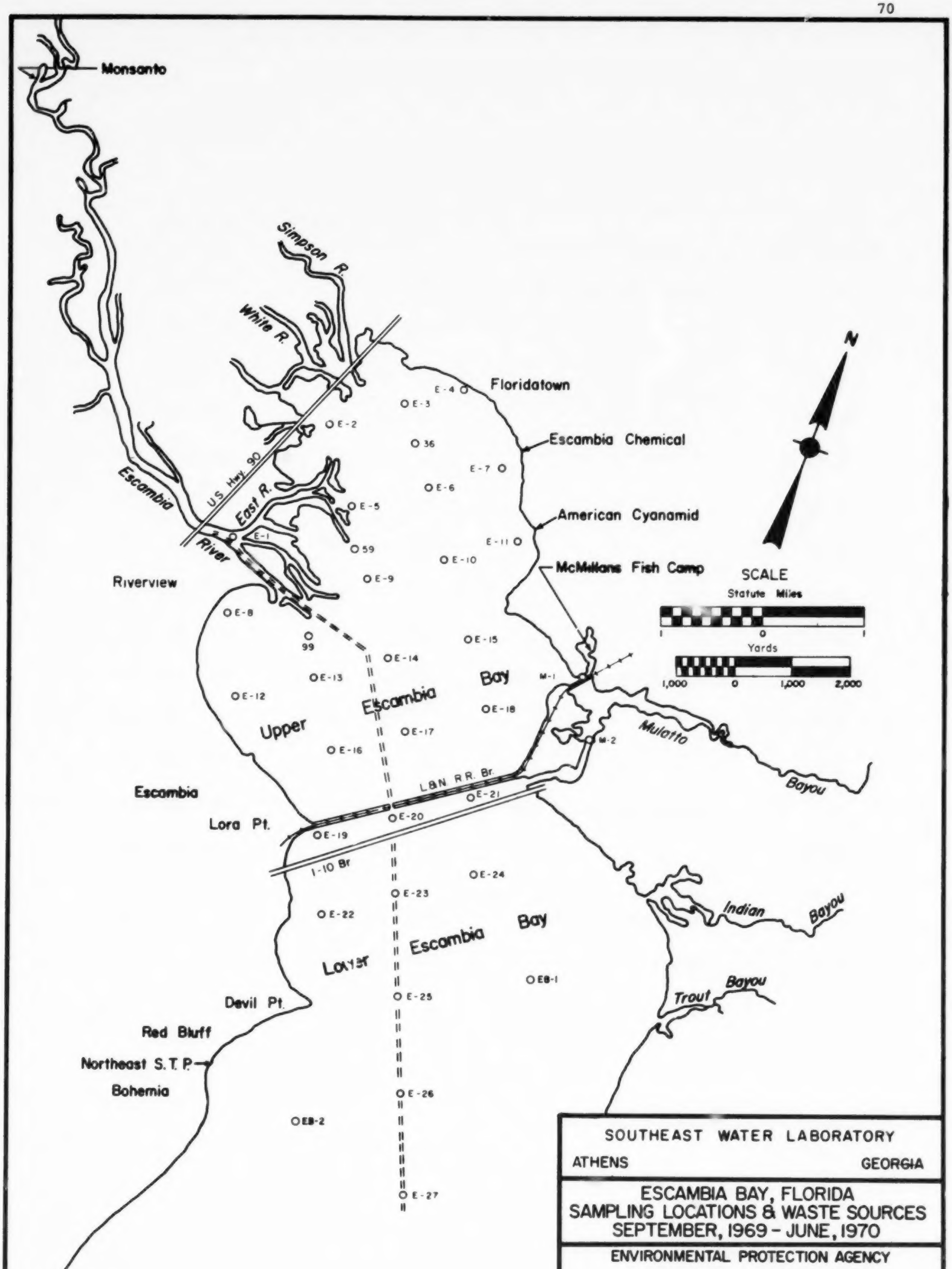
SAMPLING STATION LOCATIONS

Escambia Bay Study

June 8-10, 1970

Station Designation	General Location	Geographic Position	
		Latitude	Longitude
E-1	Confluence of Escambia and East Rivers	30° 32' 52"	87° 11' 25"
E-2	Upper Escambia Bay	30° 34' 05"	87° 10' 56"
E-3	"	30° 34' 29"	87° 10' 05"
E-4	"	30° 34' 33"	87° 09' 38"
E-5	"	30° 33' 28"	87° 10' 28"
E-6	"	30° 33' 52"	87° 09' 39"
E-7	"	30° 34' 11"	87° 09' 13"
E-8	"	30° 32' 19"	87° 11' 10"
E-9	"	30° 32' 50"	87° 10' 02"
E-10	"	30° 33' 17"	87° 09' 17"
E-11	"	30° 33' 42"	87° 08' 47"
E-12	"	30° 31' 34"	87° 10' 46"
E-13	"	30° 31' 55"	87° 10' 05"
E-14	"	30° 32' 17"	87° 09' 28"
E-15	"	30° 32' 43"	87° 08' 48"
E-16	"	30° 31' 25"	87° 09' 47"
E-17	"	30° 31' 46"	87° 09' 78"
E-18	"	30° 32' 07"	87° 08' 21"
E-19	Lower Escambia Bay	30° 30' 38"	87° 09' 35"

Station Designation	General Location	Geographic Position	
		Latitude	Longitude
E-20	Lower Escambia Bay	30° 31' 07"	87° 08' 56"
E-21	"	30° 31' 34"	87° 08' 11"
E-22	"	30° 30' 15"	87° 09' 17"
E-23	"	30° 30' 34"	87° 08' 41"
E-24	"	30° 31' 02"	87° 07' 54"
E-25	"	30° 29' 40"	87° 08' 15"
E-26	"	30° 28' 53"	87° 07' 52"
E-27	"	30° 28' 05"	87° 07' 28"
E-28	"	30° 27' 20"	87° 07' 28"
E-36	Upper Escambia Bay	30° 34' 09"	87° 09' 54"
E-59	"	30° 33' 08"	87° 10' 15"
E-99	"	30° 32' 15"	87° 10' 17"
EB-1	Lower Escambia Bay	30° 30' 25"	87° 07' 58"
EB-2	"	30° 28' 26"	87° 08' 46"
M-1	Mulatto Bayou at L&N Railroad Trestle	30° 32' 54"	87° 07' 38"
M-2	Mulatto Bayou	30° 32' 15"	87° 07' 36"


Monsanto
Simpson R.
White R.
Escambia
River
U.S. Hwy. 90
East R.
Floridatown
Escambia Chemical
American Cyanamid
McMillans Fish Camp
N
SCALE
Statute Miles
1
0
1
Yards
1,000
0
1,000
2,000
Riverview
E-1
E-2
E-3
E-4
36
E-5
E-6
E-7
59
E-8
E-9
E-10
E-11
99
E-12
E-13
E-14
E-15
E-16
E-17
E-18
M-1
M-2
Mulatto
Bayou
Upper
Escambia
Bay
L&N R.R. Br.
Escambia
Lora Pt.
E-19
E-20
E-21
I-10 Br.
E-22
E-23
E-24
Lower
Escambia
Bay
Indian
Bayou
EB-1
Trout
Bayou
Devil Pt.
E-25
Red Bluff
Northeast S.T.P.
Bohemia
E-26
EB-2
E-27
E-28

SOUTHEAST WATER LABORATORY

ATHENS GEORGIA

ESCAMBIA BAY, FLORIDA
SAMPLING LOCATIONS & WASTE SOURCES
SEPTEMBER, 1969 - JUNE, 1970

ENVIRONMENTAL PROTECTION AGENCY
FEDERAL WATER QUALITY ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

CONTAINER CORPORATION OF AMERICA, BREWTON PLANT, CONECUH-ESCAMBIA RIVER BASIN STUDY

Environmental Protection Agency
Water Quality Office
Southeast Water Laboratory
Technical Services Program
Athens, Georgia

February 1971

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INTRODUCTION

In August 1969, the Southeast Region of the Federal Water Pollution Control Administration[1] received a request from the Governor of Florida, for technical assistance in evaluating interstate and intrastate pollution in the Escambia River[2] and Bay. A water quality study was conducted during September and October 1969. An evaluation of the data collected during the study was presented in a January 1970 report entitled Effects of Pollution on Water Quality, Escambia River and Bay, Florida. The report was presented as evidence of pollution at a January 1970 enforcement conference called to consider the matter of pollution of interstate waters of Escambia River and Bay. The report indicated that waste discharges from Container Corporation of America's paper mill at Brewton, Alabama was the major Alabama source of pollution responsible for water quality degradation occurring in Escambia River and Bay. The Conferees adopted the recommendation that the mill remove 90% of its carbonaceous waste material. This report contains an evaluation of waste treatment efficiencies and related stream conditions and recommends specific acceptable carbonaceous waste loads in the treated effluent.

The cooperation and contribution of Container Corporation of America mill management during the study are gratefully appreciated. Particular acknowledgements are due to personnel of the mill's Technical Engineering Section.

[1] Now the Water Quality Office, Environmental Protection Agency.

[2] The Escambia River is known as the Conecuh River in Alabama.

SUMMARY

Container Corporation of America's (CCA) integrated pulp and paper mill at Brewton, Alabama is in the process of increasing pulping capacity from 900 tons per day to 1050 tons per day. Preceding the expansion is the installation of additional secondary waste treatment facilities. During August 17-28, 1970, prior to activating additional waste treatment units, the Southeast Water Laboratory, Technical Services Division, Federal Water Quality Administration, conducted a 10-day investigation of waste treatment facilities and related stream quality conditions. The study revealed the following:

* The wastewater volume was 35.6 mgd.
* The untreated 5-day BOD load presently produced at the mill averaged 44,500 pounds per day.
* Treatment facilities removed 81% of the 5-day BOD.
* Daily discharged effluent contained 8,500 pounds of 5-day BOD, which is equivalent to the waste from a population of 49,900.
* Of the 67,500 pounds per day of TOC measured before treatment, 20,800 pounds was discharged daily into the Conecuh River.
* The average TOC reduction was 69%.
* At river stations downstream from the CCA mill, the average dissolved oxygen concentrations ranged from 6.4 to 7.4 mg/l, pH ranged from 6.1 to 7.2, and temperatures varied from 23.5 to 30°C.

CONCLUSIONS

1. In-plant controls are sufficient to reduce the raw 5-day BOD load to 44,500 pounds per day. For the amount of pulp and paper produced, this load is 10,400 pounds per day less than the average 5-day BOD reported for mills in the southern pulp and paper industry. [1/] The volume of wastewater (35.6 mgd) is 10.2 mgd more than the average from southern Kraft operations.

2. At the time of the survey, treatment facilities were not achieving the 90% BOD and TOC reductions recommended by the Conferees.

3. Water quality standards for dissolved oxygen, pH and temperature were met in the Conecuh-Escambia River downstream from the CCA paper mill.

[1/] Survey of Water Utilization and Waste Control Practices in the Southern Pulp and Paper Industry, Water Resources Research Institute, University of North Carolina, June 1970.

RECOMMENDATIONS

1. Recommendations adopted in the 1970 enforcement conference called for a reduction of 90% of the carbonaceous waste load at the Container Corporation mill. The following specific effluent limitations should be added to these recommendations:

- At the present mill pulping capacity of 900 tons per day, the 5-day BOD and TOC loads discharged into the Conecuh River shall not exceed 4,450 and 6,750 pounds per day respectively.
- The effects of the present expansion of the mill's pulping capacity on the above recommendations will be evaluated and reviewed by the Conferees.

2. The investigation revealed that the only treatment the bleach plant and woodyard wastes receives is in the natural ponding system. It is recommended that secondary treatment be provided for these wastes.

STUDY AREA

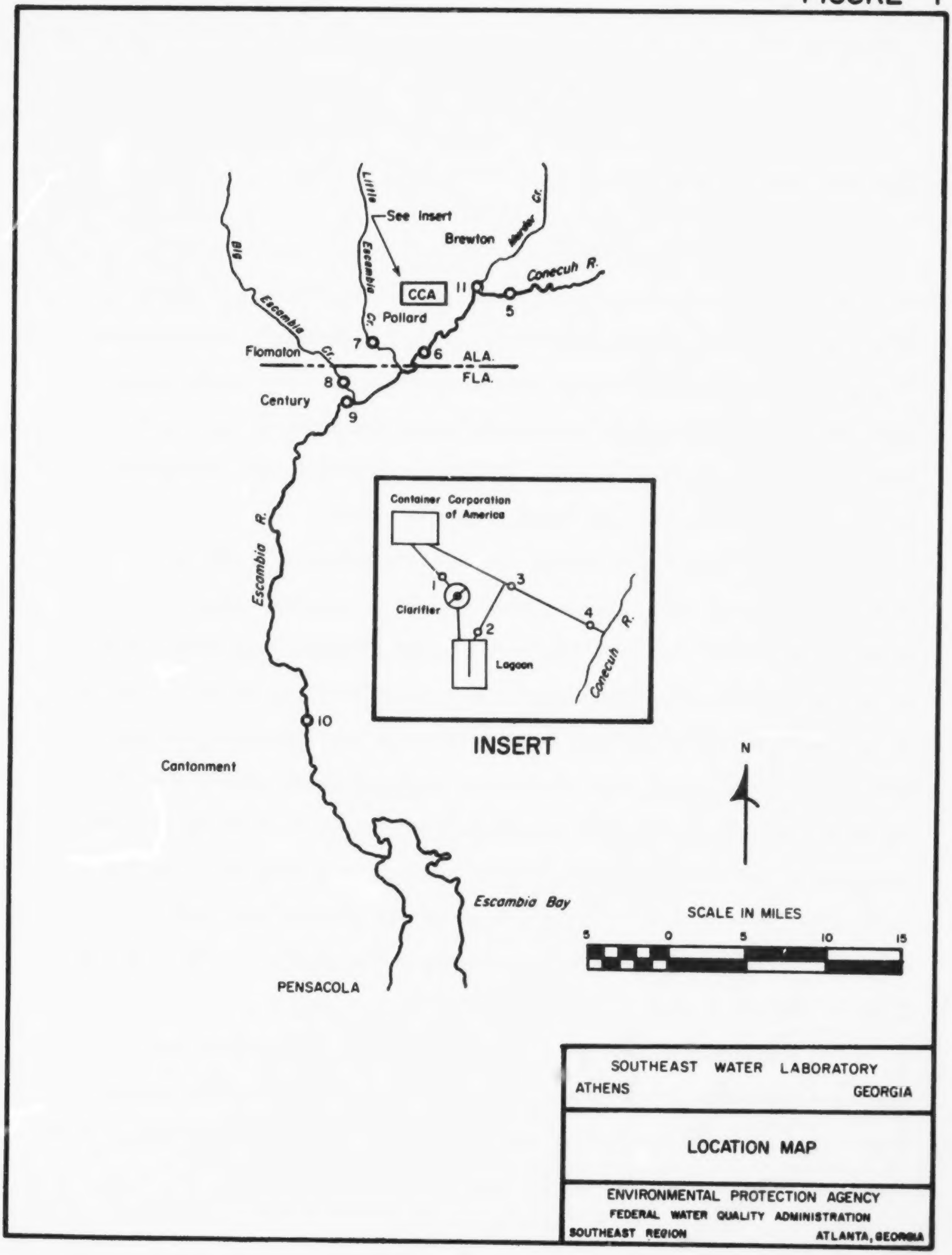
CONTAINER CORPORATION PLANT

Container Corporation of America's plant at Brewton, Alabama, is a 900 ton per day integrated pulp and paper mill. During the August 1970 study period, the mill produced 35.6 mgd of wastewater. Approximately 19.6 mgd resulted from unbleached pulp and paper operations, while bleach plant and woodyard operations accounted for the remaining 16 mgd. Surface runoff from the small Franklin Mill Creek watershed also contributes to the total wastewater volume leaving the plant area.

At the mill, pulp process wastes are conveyed to a 300-foot diameter mechanical clarifier for setteable solids removal. Liquid oxygen is applied to the clarified pulp process effluent as it flows into a treatment lagoon system (Figure 1). Wastes are retained in the lagoon for an estimated eight days of biological degradation and continued settling. Overflow from the lagoon next mixes with untreated bleach plant and woodyard wastes where both are conveyed via Franklin Mill Creek to a series of lakes. Estimated detention time in the lakes is approximately five days. At the final lake, Brewton Lake, a surface mixer aerates the effluent prior to discharge into the Conecuh River (at a point approximately one mile upstream from the Alabama-Florida state line).

Additional secondary treatment facilities to be placed into operation include a 22-acre lagoon with mechanical aerators. The aerated lagoon will precede the existing 140-acre lagoon. The new lagoon was scheduled to become operational in January 1971.

FIGURE 1


Little Escambia Cr.
See Insert
Brewton
Murder Cr.
Conecuh R.
Big Escambia Cr.
CCA
11
5
Pollard
7
6
Flomaton
ALA.
FLA.
8
Century
9
Escambia R.
Container Corporation of America
1
3
Clarifier
4
2
Lagoon
Conecuh R.
INSERT
N
10
Cantonment
Escambia Bay
SCALE IN MILES
5
0
5
10
15
PENSACOLA

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

LOCATION MAP

ENVIRONMENTAL PROTECTION AGENCY
FEDERAL WATER QUALITY ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

CONECUH-ESCAMBIA RIVER

The Conecuh-Escambia River rises near Union Springs, Alabama, and terminates its south-southwestward journey in Escambia Bay at Pensacola, Florida. Major tributaries in the vicinity of the Alabama-Florida state line include Little Escambia Creek, Big Escambia Creek and Murder Creek. Little Escambia and Murder Creeks both receive municipal waste discharges. The Escambia River at Century, Florida has an average discharge of 5,952 cfs (37 years of record) with extremes from 596 cfs to 77,200 cfs. The seven-day 10-year low flow is 785 cfs.

The entire river reach is classified for recreation and/or fish and wildlife propagation. The Florida portion of the river from Escambia Bay to the Alabama-Florida state line is classified for both recreation and fish and wildlife uses. All of the river in Alabama is classified for fish and wildlife uses with the reach from Point A Dam to the head of Gantt Lake also designated for recreational use.

STUDY PROGRAM

Following the recommendations of the 1970 enforcement conference on Escambia River and Bay, it was determined that another survey of waste discharges at the Brewton mill was needed to supplement data obtained from the 1969 field studies. The Conferees recommended that Container Corporation of America remove 90% of their carbonaceous waste material. In addition to determining allowable waste discharges, the study reported here was designed to determine the present degree of treatment obtained from existing facilities and to relate waste discharges to existing stream quality.

Eleven sampling stations were established to achieve the study goals (Table 1 & Figure 1). Four sampling stations were selected to evaluate CCA's treatment facilities, and the remaining sampling stations were selected to determine water quality in the Conecuh-Escambia River from a point immediately upstream from the mill to the river's mouth.

TABLE I
SAMPLING STATION NUMBER AND LOCATION BREWTON PAPER MILL AND CONECUH-ESCAMBIA RIVER SYSTEM

In-Plant Stations

CC-1	Clarifier influent.
CC-2	Lagoon effluent.
CC-3	Bleach plant, woodyard and lagoon effluent at Franklin Mill Creek Spillway.
CC-4	Brewton Lake discharge approximately 200 yards upstream from junction with Conecuh River.

Conecuh-Escambia River System Stations

CO-5	Conecuh River at Alabama Highway 41 near Brewton, Alabama (R.M. 67.10).
CO-6	Conecuh River one-half mile downstream from Brewton Lake discharge at Pollard boat landing (R.M. 55.90).
LE-7	Little Escambia Creek at U. S. Highway 31.
BE-8	Big Escambia Creek at Escambia County Highway.
E-9	Escambia River at Florida Highway 4 near Century, Florida (R.M. 48.80).
E-10	Escambia River at Florida Highway 184 (R.M. 13.50).
M-11	Murder Creek at CCA process water intake.

STUDY FINDINGS

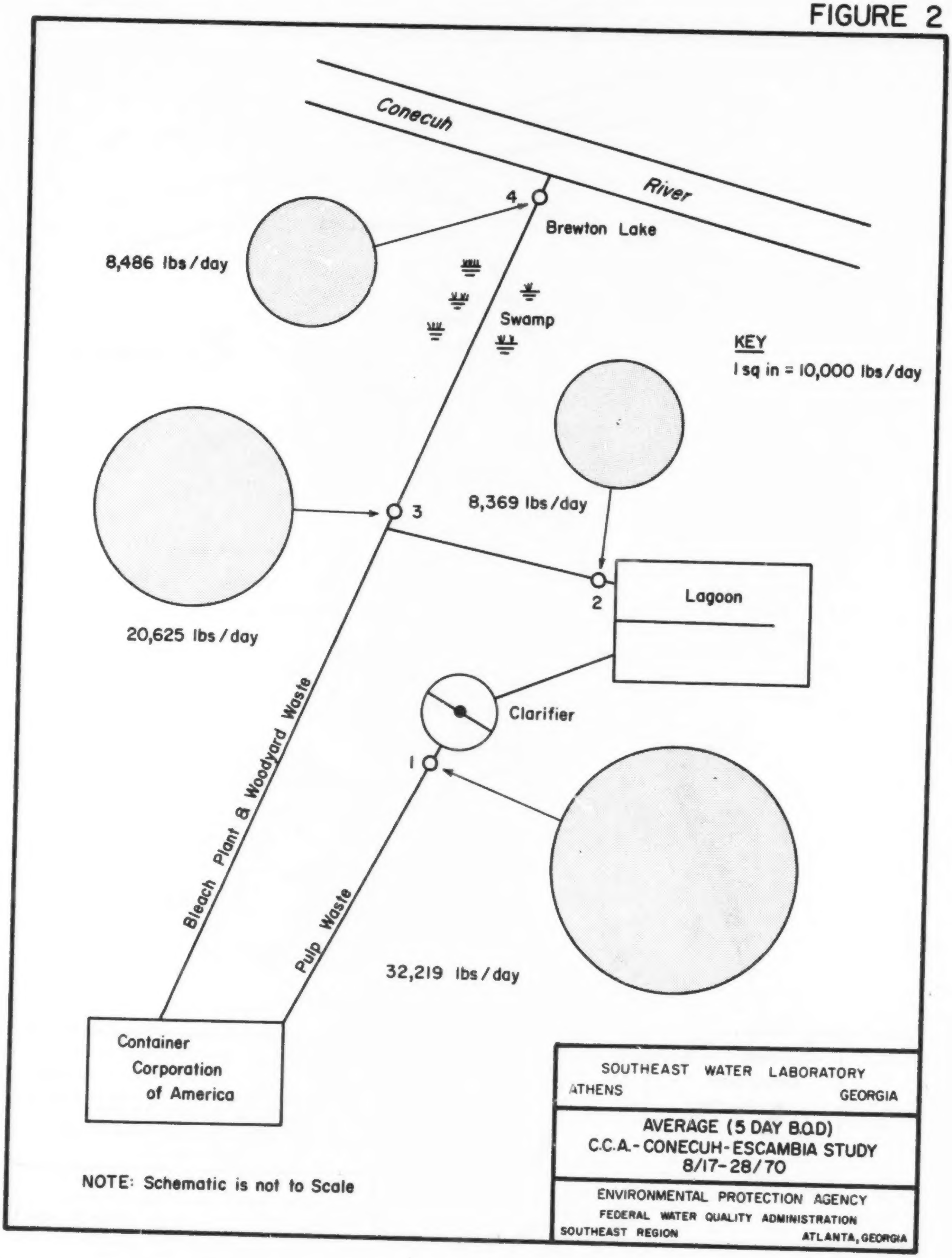
CONTAINER CORPORATION PLANT

The relative change in BOD and TOC as the waste receives different stages of treatment is reflected in Figures 2, 3 and 4. Existing treatment reduces the untreated 5-day BOD load of 44,500 pounds per day by 81% to 8500 pounds per day. The discharged BOD population equivalent [1/] is 49,900. Total organic carbon is reduced from 67,500 pounds per day to 20,800 pounds, an overall reduction of 69%. The TOC reduction of the pulping wastes routed through the clarifier and the lagoon system alone is 85%, while the corresponding 5-day BOD reduction is 74%. The 5-day BOD reduction across the lakes is about four times greater than the corresponding TOC reduction. Table 2 contains a summary of data from the mill survey.

The Water Resources Research Institute at the University of North Carolina has recently issued a publication which includes a survey of the amount of waste and wastewater generated per ton of production for different types of mills in the southern pulp and paper industry. This publication shows the average volume of wastewater per ton of product is 18,500 gallons for unbleached product and 38,000 gallons for bleached product. The Brewton Mill presently produces approximately 900 tons per day of pulp. Approximately half of this production is bleached. Wastewater flow during the survey was about 35.6 mgd. The average for southern Kraft operation is 25.4 mgd for a 900 ton plant.

[1/] One population equivalent = 0.17 pounds per capita per day.

FIGURE 2

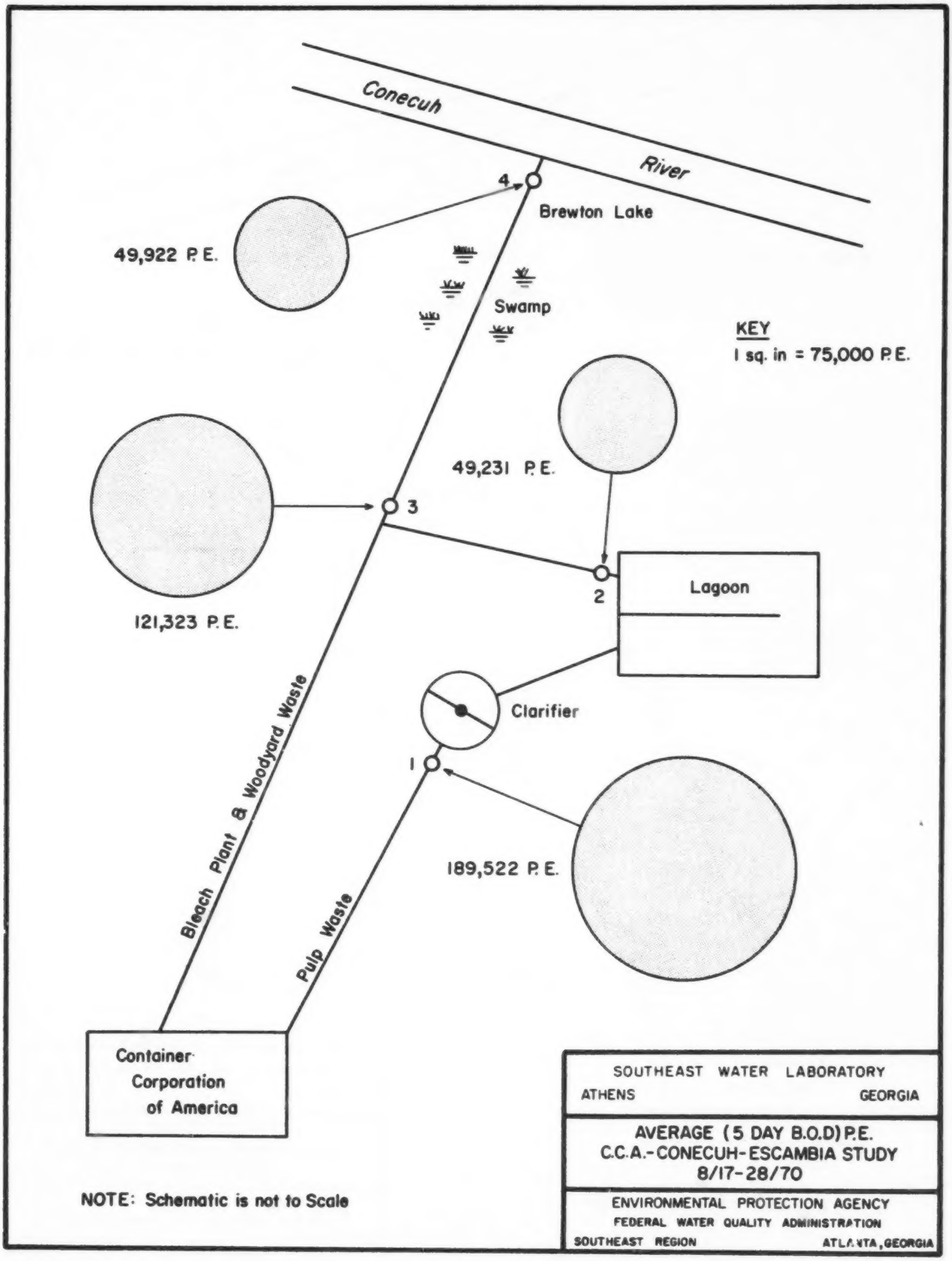

Conecuh River
4
Brewton Lake
8,486 lbs/day
Swamp
KEY
1 sq in = 10,000 lbs/day
3
8,369 lbs/day
2
Lagoon
20,625 lbs/day
Clarifier
1
Bleach Plant & Woodyard Waste
Pulp Waste
32,219 lbs/day
Container Corporation of America
NOTE: Schematic is not to Scale

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

AVERAGE (5 DAY B.O.D)
C.C.A.-CONECUH-ESCAMBIA STUDY
8/17-28/70

ENVIRONMENTAL PROTECTION AGENCY
FEDERAL WATER QUALITY ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

FIGURE 3

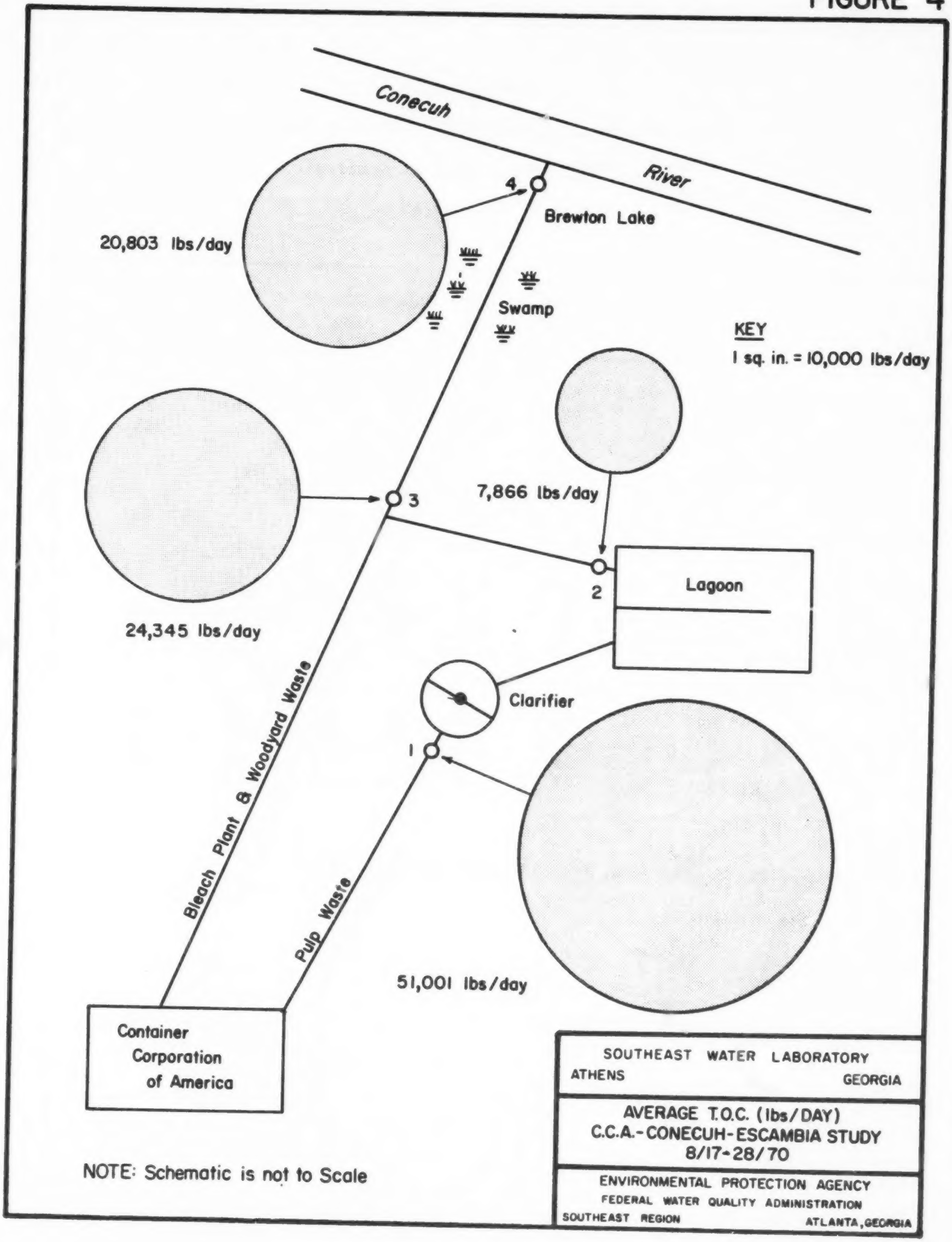

Conecuh
River
4
Brewton Lake
49,922 P.E.
Swamp
KEY
1 sq. in = 75,000 P.E.
49,231 P.E.
3
121,323 P.E.
2
Lagoon
Clarifier
1
Bleach Plant & Woodyard Waste
Pulp Waste
189,522 P.E.
Container Corporation of America
NOTE: Schematic is not to Scale

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

AVERAGE (5 DAY B.O.D) P.E.
C.C.A.-CONECUH-ESCAMBIA STUDY
8/17-28/70

ENVIRONMENTAL PROTECTION AGENCY
FEDERAL WATER QUALITY ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

FIGURE 4


Conecuh River
4
Brewton Lake
20,803 lbs/day
Swamp
KEY
I sq. in. = 10,000 lbs/day
7,866 lbs/day
3
24,345 lbs/day
2
Lagoon
Clarifier
1
Bleach Plant & Woodyard Waste
Pulp Waste
51,001 lbs/day
Container Corporation of America

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

AVERAGE T.O.C. (lbs/DAY)
C.C.A.-CONECUH-ESCAMBIA STUDY
8/17-28/70

ENVIRONMENTAL PROTECTION AGENCY
FEDERAL WATER QUALITY ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

NOTE: Schematic is not to Scale

TABLE 2

Waste Treatment Survey Data - Brewton Mill

Container Corporation of America

August 17-28, 1970

Station No. & Location	Range	Flow (cfs)	Water Temp. (°C)	pH (units)	Color	BOD$_5$ (mg/l)	TOC (mg/l)	Residue Non-Filterable (mg/l)	Residue Volatile (mg/l)
CC-1 Clarifier Influent	Max	30.4	42.8	9	400	360	820	700	520
	Min	30.4	29.0	7.1	150	90	66	38	21
	Mean	30.4	41.1	8.0	250	197	312	263	187
CC-2 Lagoon Effluent	Max	27.9	35.0	7.5	250	81	75	120	95
	Min	27.9	26.5	6.6	200	34	40	8	6
	Mean	27.9	29.3	7.2	215	56	52	55	34
CC-3 Bleach plant, lagoon & woodyard effluent	Max	93	35.5	7.2	500	73	120	50	22
	Min	62	24.5	5.3	200	23	31	31	11
	Mean	77.5 [1]	29.5	6.3	390	51.2	62	37	16
	Wt. Avg. [2]	77.5	29.1	6.4	380	49.5	58.3	37	16
CC-4 Brewton Lake Discharge	Max	103.9	30.5	7.2	500	28	55	28	15
	Min	77.5	24.5	6.0	300	12	22	14	1
	Mean	90.7 [1]	27.8	6.6	417	18.2	46	20	9
	Wt. Avg. [2]	90.7	27.1	6.6	409	17.4	42.6	20	9

[1] Includes unpolluted flow from Franklin Mill Creek.

[2] Flow weighted average.

The Water Resources Research Institute publication shows average 5-day BOD loads before treatment for unbleached and bleached pulp and paper mills to be 43 and 79 pounds per ton of production respectively. Using these values and present mill production figures, the calculated load for the CCA mill is 54,900 pounds per day of 5-day BOD. The present raw load generated is 10,400 pounds per day less than the average load from southern Kraft operations.

CONECUH-ESCAMBIA RIVER QUALITY

Conecuh-Escambia River stream data collected as part of the study (see Table 3) showed that the average temperature and pH values of 26.9°C and 6.9 units at Pollard Landing (1/2 mile downstream from plant discharge) were very close to background values of the Conecuh River upstream from the CCA mill. Average dissolved oxygen (DO) concentration at all river stations was greater than or equal to 6.4 mg/l. The minimum DO concentration observed in the river was 5.8 mg/l at the Highway 184 bridge (Station E-10).

The TOC concentrations in the river were higher during the second week of the survey -- probably because of increased runoff. At Pollard Landing, an average TOC concentration of 8.6 mg/l was found -- 28% greater than at station CO-5 (assumed to exemplify background conditions). The Escambia River near the state line (E-9) had a mean TOC of 9.7 mg/l. Thirty-five miles downstream -- Florida Highway 184 bridge -- the average TOC was 8.8 mg/l, no significant change. The average TOC concentrations for river stations are shown in Figure 5.

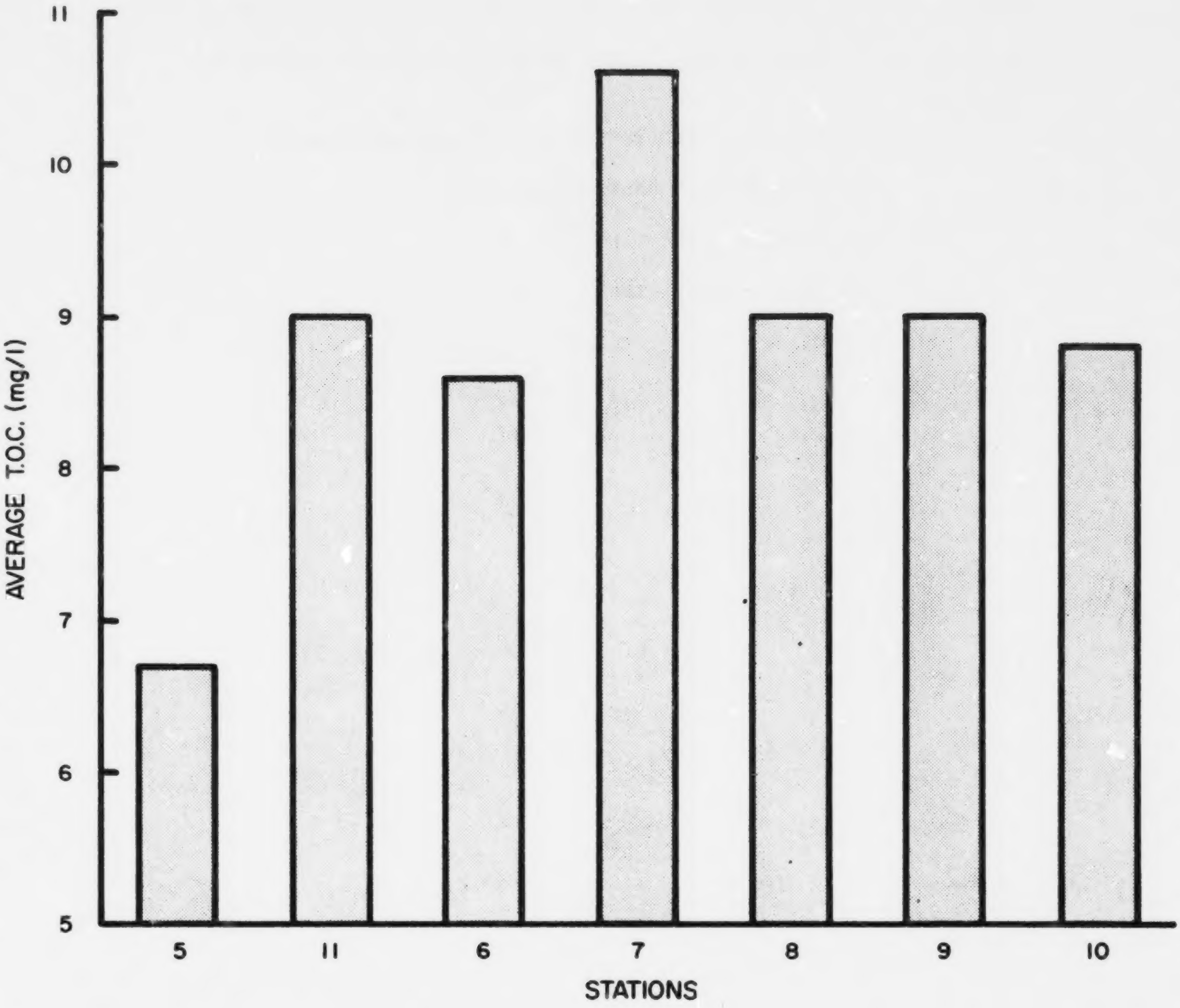
TABLE 3

Water Quality Survey Data

Conecuh-Escambia River System

Station No. & Location	Range	Flow (cfs)	DO (mg/1)	Water Temp. (^{o}C)	pH (units)	BOD$_5$ (mg/1)	TOC (mg/1)	Residue Non-Filterable (mg/1)	Residue Volatile (mg/1)
CO-5 Conecuh River @ Ala. Hwy 41	Max	-	8.6	30	7.2	2.7	11	40	14
	Min	-	7.3	24	6.5	0.2	4	10	1
	Mean	-	7.9	26.9	6.8	1.5	6.7	23	5
CO-6 Conecuh River ½ mi. below Brewton Lake at Pollard Landing	Max	-	7.8	30	7.2	3.0	15	36	8
	Min	-	7.0	24	6.5	1.5	6	8	1
	Mean	-	7.4	26.7	6.8	2.2	8.6	23	4
LE-7 Little Escambia Ck @ U.S. 31	Max	-	8.9	27	6.5	1.3	17	57	9
	Min	-	6.5	21.5	4.1	0.3	5	5	1
	Mean	-	7.7	23.6	5.1	0.9	10.6	16	4
BE-8 Big Escambia Cr @ Escambia Co. Road	Max	-	7.8	28	6.6	1.9	27	24	11
	Min	-	6.0	21.5	5.4	0.7	4	9	1
	Mean	-	7.2	24.7	5.7	1.2	9.0	15	6
E-9 Escambia Rv. @ Fla. Hwy 4	Max	6350	7.6	29	6.9	4.2	14	43	9
	Min	3170	6.7	23.5	6.1	1.1	6	15	1
	Mean	4760	7.2	26.3	6.5	1.6	9.2	22	4
E-10 Escambia Rv @ Fla. Hwy 184	Max	6350	7.2	29	6.8	3.9	17	22	6
	Min	3170	5.8	24	6.1	0.8	5	3	1
	Mean	4680	6.4	26.5	6.4	1.6	8.8	15	3
M-11 Murder Ck @ CCA Process Water Intake	Max	-	8.2	26	7.1	1.9	14	51	10
	Min	-	7.4	22	6.3	0.3	5	5	1
	Mean	-	7.9	23.5	6.6	1.3	8.9	23	5

FIGURE 5
AVERAGE T.O.C. (mg/l)
C.C.A.-CONECUH-ESCAMBIA STUDY
8/17-28/70



APPENDIX A

ACKNOWLEDGEMENT

The cooperation and resources of the Container Corporation contributed to a successful study. Sincere thanks are extended to John Fay, Technical Superintendent; Rudy Yuhasz, Shift Supervisor; William Brantly, Project Engineer; the remaining members of the technical section; and to other Brewton plant personnel for their support.

Southeast Water Laboratory's field personnel were:

Dennis Cafaro - Sanitary Engineer
Pat Lawless - Chemist
Tom Sack - Technician
Roy Wiemert - Technician

APPENDIX B

SAMPLING PROCEDURE

CCA and FWQA personnel cooperated in a 10-day split sampling schedule from August 17-28, 1970. Composite samples were collected at station CC-1, while all others were grab samples collected twice per day -- one set in the morning, the second set in the afternoon. Samples from stations CC-1, CC-2, CC-3 and CC-4 were routinely analyzed for temperature, pH, 5-day BOD, and TOC. Station CC-4 samples were also analyzed for DO. Volatile and total suspended solids were determined only on the morning set.

All river and tributary station samples were analyzed for DO, temperature, pH, 5-day BOD and TOC. The morning set was additionally analyzed for total and volatile suspended solids.

Samples were obtained using a DO dunker sampler at all river and tributary stations. The DO bottle was removed from the sampler and taken through the second step of the modified Winkler method in the field. The remaining excess water was then measured for temperature and poured into a two-liter container. The container and the fixed DO sample were placed into an ice chest until the entire sample run was completed. Samples were then transported to a mobile lab. Samples from in-plant stations were obtained with a bucket-type sampling device.

Dissolved oxygen, pH and five-day BOD were determined in the mobile lab. The TOC and total and volatile suspended solids were returned to the Southeast Water Laboratory, Athens, Georgia for analysis.

APPENDIX C

ANALYTICAL METHODS

The following analytical methods were used by FWQA personnel:

DO - Modified Winkler with Full-Bottle Technique - "FWPCA Methods for Chemical Analysis of Water and Wastes," November 1969.

TOC - Single Channel Instrument, Dow Beckman Carbonaceous Analyzer, "FWPCA Methods for Chemical Analysis of Water and Wastes," November 1969.

Five-day BOD - "FWPCA Methods for Chemical Analysis of Water and Wastes," November 1969. (Using the Conecuh River water at station CO-5 for dilution of in-plant samples).

pH - Laboratory Instrument meter.

Solids - Total suspended solids, "FWPCA Methods for Chemical Analysis of Water and Wastes," November 1969; total volatile suspended solids, "Standard Methods for the Examination of Water and Wastewater," 12th Edition, 1965.

APPENDIX D

METEOROLOGY AND STREAMFLOW

The average monthly temperature during the survey was 1°F below normal, but precipitation was 2.09 inches above normal.[1] The first week of study was warm and only isolated scattered showers occurred. Three days of heavy rainfall fell the second week. Average flows in the Escambia River at the Century, Florida, U.S.G.S. gage were:

August 17-21	3,169 cfs
August 24-28	6,352 cfs

Flow values for in-plant stations were provided by CCA:

Sampling Point	Weekly Average (mgd)	
	8/17-21	8/24-28
CC-1, Clarifier Inlet	19.6	19.6
CC-2, Oxidation Pond Outlet	18.0	18.0
CC-3, Spillway	40.0	60.0
CC-4, Brewton Lake	50.0	67.0

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[1] U. S. Department of Commerce, ESSA, Climatological Data, Alabama, August 1970. Vol. 76, No. 8.

MR. LITTLE: First from the Escambia Bay circulation study.

The "Effects of Pollution on Water Quality - Escambia River and Bay, Florida" were investigated during a period of low Escambia River discharge (1,068 cfs) in September and October 1969. The tidal circulation and bottom sediment characteristics of the bay were reported. Further circulation and more extensive sediment characterization studies were made in June 1970 at much higher river flows (59,533 cfs). This report presents these results and compares them with those of the 1969 study.

The findings of this study.

Both studies show that Escambia Bay sediments are highly organic and tidal circulation in Upper Escambia Bay is poor. Because of these conditions, sediment disturbances--such as result from dredging--can cause severe oxygen depletion. Massive fish kills could result.

Escambia Bay circulation is generally counterclockwise at both low and high Escambia River flows. Water flows out from the west portion of the bay; saline water intrudes on the eastern side. Freshwater flushing is more significant than saline water circulation exchange when river discharge exceeds the mean annual discharge. The Escambia River flows southeastward into the bay, creating a large eddy current counterclockwise to the north, which impedes tidal exchange in Upper Escambia Bay. During low-flow periods, the small creeks in the extreme northern end of the bay do not discharge a sufficient amount of freshwater to flush the area, and persistent pollutants are effectively trapped.

The piling--primarily unused and unnecessary piling--of the Louisville and Nashville Railroad Company bridge restricts circulation between Upper and Lower Escambia Bay.

Organic carbon content of bay sediment ranges from 2.3 to 5.0 percent. Sediment containing more than 3.0 percent organic carbon covers 46 percent of the upper bay. These results agree with the previous study.

About 40 percent of the upper bay sediment contains more than 0.2 percent total organic nitrogen; 35 percent of the same area contains more than 0.03 percent phosphorus. Total oxygen demand of sediments ranged from 25 to 100 grams per kilogram on a dry weight basis. Thirty percent of the upper bay sediment TOD exceeds 100 grams per kilogram.

Unconsolidated sediment depth ranged from less than two to greater than six feet. About one-third of the upper bay is covered with unconsolidated sediment greater than six feet deep.

The benthic characterization study also shows counter-clockwise bay circulation. The benthic study suggest that wastes discharged along the eastern shore of the bay (from American Cyanamid and Escambia Chemical companies) are generally swept northwestward and deposited along with wastes from Monsanto and Container Corporation in the central and western portions of the upper and lower bay.

The recommendations from this second study are as follows:

1. Recommendations Nos. 1 and 2 of the 1970 Federal-State Enforcement Conference which deal with adequate treatment and/or complete removal of Escambia Bay waste sources should be implemented at the earliest date in order to eliminate the continued buildup of organic sediment deposits in Escambia Bay.

2. The prohibition on construction and control of maintenance dredging, Enforcement Conference Recommendation No. 4, should be extended until the artificial buildup of organic sediment deposits ceases and these deposits stabilize. Spoil from all dredging--now and in the future--should be deposited on diked upland locations.

3. Modification of the Louisville and Nashville Railroad trestle, Enforcement Conference Recommendation No. 5, should include removal of unused and unnecessary bridge piling and old construction debris. This should minimize any effect the bridge has on bay circulation.

Mr. Chairman, I will pause here if there are any questions. If not, I will proceed on with the second report.

MR. WHITE: Are there any questions by the conferees?

MR. TRAINA: I would like to ask one.

Mr. Little, the study was done in June. Was this prior to the time the piles were removed from the L & N Bridge?

MR. LITTLE: I think that the time may have been approximately the same. I am not certain of the time of removal of some of the unused piling at the L & N Bridge.

MR. TRAINA: Thank you.

MR. WHITE: Proceed.

MR. LITTLE: The second report on the Container Corporation.

In August 1969, the Southeast Region of the Federal Water Pollution Control Administration received a request from the Governor of Florida for technical assistance in evaluating interstate and intrastate pollution in the Escambia River and Bay. A water quality study was conducted during September and October 1969. An evaluation of the data collected during the study was presented in a January 1970 report entitled Effects of Pollution on Water Quality, Escambia River and Bay, Florida. The report was presented as evidence of pollution at a January 1970 enforcement conference called to consider the matter of pollution of interstate waters of Escambia River and Bay. The report indicated that waste discharges from Container

Corporation of America's paper mill at Brewton, Alabama, was the major Alabama source of pollution responsible for water quality degradation occurring in Escambia River and Bay. The conferees adopted the recommendation that the mill remove 90 percent of its carbonaceous waste material. This report contains an evaluation of waste treatment efficiencies and related stream conditions and recommends specific acceptable carbonaceous waste loads in the treated effluent.

The cooperation and contribution of Container Corporation of America mill management during the study are gratefully appreciated.

Summary of the findings.

Container Corporation of America's integrated pulp and paper mill at Brewton, Alabama, is in the process of increasing pulping capacity from 900 tons per day to 1,050 tons per day. Preceding the expansion is the installation of additional secondary waste treatment facilities. During August 17-28, 1970, prior to activating additional waste treatment units, the Southeast Water Laboratory, Technical Services Division, Federal Water Quality Administration, conducted a 10-day investigation of waste treatment facilities and related stream quality conditions. The study revealed the following:

* The wastewater volume was 35.6 mgd.

* The untreated 5-day BOD load presently produced

at the mill averaged 44,500 pounds per day.

* Treatment facilities removed 81 percent of the 5-day BOD.

* Daily discharged effluent contained 8,500 pounds of 5-day BOD, which is equivalent to the waste from a population of 49,900.

* Of the 67,500 pounds per day of total organic carbon, measured before treatment, 20,800 pounds was discharged daily into the Conecuh River.

* The average TOC reduction was 69 percent.

* At river stations downstream from the Container mill, the average dissolved oxygen concentrations ranged from 6.4 to 7.4 mg/l, pH ranged from 6.1 to 7.2, and temperatures varied from 23.5 to 30° C.

Conclusion of the study.

1. In-plant controls are sufficient to reduce the raw 5-day BOD load to 44,500 pounds per day. For the amount of pulp and paper produced, this load is 10,400 pounds per day less than the average 5-day BOD reported for mills in the southern pulp and paper industry. The reference for obtaining this average was from a publication entitled _Survey of Water Utilization and Waste Control Practices in the Southern Pulp and Paper Industry_, Water Resources Research Institute, University of North Carolina, June 1970. The volume of wastewater, 35.6

million gallons per day, is 10.2 million gallons per day more than the average from southern Kraft operations.

2. At the time of the survey, treatment facilities were not achieving the 90 percent BOD and TOC reductions recommended by the conferees.

3. Water quality standards for dissolved oxygen, pH and temperature were met in the Conecuh-Escambia River downstream from the Container paper mill.

Recommendations from this study.

1. Recommendations adopted in the 1970 enforcement conference called for a reduction of 90 percent of the carbonaceous waste load at the Container Corporation mill. The following specific effluent limitations should be added to these recommendations:

* At the present mill pulping capacity of 900 tons per day, the 5-day BOD and TOC loads discharged into the Conecuh River shall not exceed 4,450 and 6,750 pounds per day respectively.

* The effects of the present expansion of the mill's pulping capacity on the above recommendations will be evaluated and reviewed by the conferees.

2. The investigation revealed that the only treatment the bleach plant and woodyard wastes receives is in the natural ponding system. It is recommended that secondary treatment be

provided for these wastes.

Mr. Chairman, that concludes the presentation.

MR. WHITE: Thank you, Mr. Little.

Are there any questions or comments at this time?

If not, we will proceed with the rest of the presentation.

MR. TRAINA: Mr. R. W. Davis with the U. S. Army Corps of Engineers.

R. W. DAVIS, OPERATIONS DIVISION
MOBILE DISTRICT CORPS OF ENGINEERS, MOBILE, ALABAMA

MR. DAVIS: Mr. Chairman, conferees, ladies and gentlemen.

I am R. W. Davis, Mobile District, Corps of Engineers. The Corps appreciates this opportunity to make a statement at this reconvened hearing.

At the original conference held in January of 1970 Colonel Robert E. Snetzer, then District Engineer, presented the conferees with a description of the activities of the Corps of Engineers within the Escambia River Basin. The authorized navigation channel and the maintenance dredging required to keep the channel to its authorized dimensions were described and the permit process required by Section 10 of the River and

Harbor Act of 1899 was explained.

At the conclusion of the conference, several recommendations were made by the conferees, one of which included certain restrictions to be placed upon maintenance dredging. In March 1970 the Mobile District Engineer informed the Regional Director of the then Federal Water Pollution Control Agency of reservations about the language of those restrictions. It was pointed out that the wording which required "diking of the dredging area" needed revision and that the disposal of all dredged material on upland sites presented very real problems in built-up areas where such sites are not available or are remote from the dredging operations. The original language has not been altered as far as can be determined and again it is suggested that the language of their recommendation be revised.

A meeting between Corps personnel and FWPCA in April of 1970 was held for the purpose of discussing the recommendation for a moratorium on dredging in Escambia Bay and FWPCA personnel informed the Corps representatives that the moratorium did not nor was not intended to apply to maintenance of the project channel. It was further agreed that such work would continue as necessary.

Maintenance dredging of the Escambia River Channel was necessary this past December in an area immediately upstream from the U. S. Highway 90 bridge crossing of the Escambia River.

All material dredged from this location was placed in an approved area on shore. Checking during and since dredging operations indicates that all material was retained within the approved spoil area.

Another item of interest I should like to bring to your attention is a new permit program under the Refuse Act, Section 13, of the River and Harbor Act of 1899 which is being established as directed by Presidential order. Under this new program, permits will be required for all present and future discharges into navigable waters or their tributaries. All firms currently discharging into navigable waters or their tributaries without a permit will be required to make permit application to the Corps of Engineers by 1 July 1971. Under these new regulations, decision as to issuance of a permit will be based on an evaluation of the impact of the discharge on anchorage and navigation, water quality standards, and on fish and wildlife resources, and no permit will be issued without certification from the appropriate State or Interstate agency that such discharges are consistent with applicable water quality standards nor will a permit be issued if the Environmental Protection Agency recommends denial of the permit for water quality considerations.

After all required regulatory information is received in conjunction with an application, public notice procedure will be followed as in the past to determine the views of all interested parties.

Mr. Chairman, again, thank you for this opportunity for making this presentation.

MR. WHITE: Thank you, Mr. Davis.

I would like to confirm the statement you made about the need for clarifying our diking provision. I think we are agreed on this, it hasn't been done officially because we haven't had a forum again where it could be done. I am sure the conferees will take this into consideration.

But I think that we are all still very concerned with any dredging in the bay area now and will continue to be very concerned with it. I think we are probably going to have to ask for very close cooperation with your office in planning these projects, particularly the time of the year, which I think is very important. If we can keep the maintenance dredging confined to periods of cool weather, we might be able to head off any problems.

But also I think we are going to really have to monitor this disposal of waste to upland sites and ask for it in practically every case. I know this might be a hardship, but I think it is going to have to be done.

Are there any other questions or comments?

MR. REED: I have a comment.

MR. WHITE: Mr. Reed.

MR. REED: Mr. Davis, Col. Griffith is the new District Engineer in Mobile?

MR. DAVIS: That is correct, yes.

MR. REED: Please extend our best wishes to the Colonel. And I would like to reemphasize from the State's position the grave apprehension we have toward any dredging in the Escambia River and Bay. We have received, I think, concise information of the dangers of stirring up these benthic deposits and they are going to have to be much more closely coordinated with State and Federal agencies in the future. I would like you to personally bring that recommendation from me as the State's conferee to the Colonel, because I want him to fully understand the importance of limiting the dredging activities in the Escambia Bay.

MR. DAVIS: I will do that.

MR. REED: Thank you, sir.

MR. TRAINA: Mr. Davis, does the Corps have presently before it any applications for construction dredging or do you anticipate any?

MR. DAVIS: None whatsoever, no.

MR. TRAINA: Has your office looked at possible sites for spoil deposits for future maintenance dredging works?

MR. DAVIS: Yes, we have, and we are continuing to do so.

MR. TRAINA: I would think if those sites are available, and perhaps to head off any possible problems we could have later, I think if those sites were made available to the conferees it would be very helpful. Could those sites be made available to us?

MR. DAVIS: Yes, they could.

MR. TRAINA: All right, thank you.

MR. WHITE: Just one other question. Maybe this is far fetched from your viewpoint, but in situations where you are dredging in the main channel at a considerable distance from the shoreline, is it not practical to go ahead and barge this material somewhere else where it would do less harm?

MR. DAVIS: Yes, it could be practicable. We are finding that things that seemed impracticable a few years ago are becoming more practicable. (Laughter.)

MR. WHITE: Well, very good. I just wanted your observation on that and we appreciate your appearing before us today.

MR. DAVIS: Thank you.

MR. TRAINA: Thank you, Mr. Davis.

Mr. Tom Duke, who is the Lab. Director of the Environmental Protection Agency's laboratory here in Gulf Breeze.

I might say officially welcome to EPA.

MR. DUKE: Thank you.

THOMAS W. DUKE, LABORATORY DIRECTOR
U. S. ENVIRONMENTAL PROTECTION AGENCY
PESTICIDE LABORATORY
GULF BREEZE, FLORIDA

MR. DUKE: Mr. Chairman, conferees, ladies and gentlemen.

I am Dr. Thomas Duke, Director of the EPA Pesticide Laboratory at Gulf Breeze, Florida.

Our laboratory has continued to participate in pollution studies since the last meeting and particularly to monitor the biota, sediments, and water for pollutant chemicals. As we reported in the proceedings of the last enforcement conference, we traced or we located, found, the occurrence of a polychlorinated biphenyl, Aroclor 1254, in the sediments and biota of Escambia Bay and surrounding waters and in the Escambia River. Today I would like to just recap this briefly and talk about what we have done since the last conference.

We located this chemical in oysters in a regular monitoring program in the summer of 1969 and through sampling located a source of PCB at the Monsanto Chemical Plant on Escambia River. When the plant was notified of this, after cooperation with State agencies and the University of West

Florida, this source was found and the source was found to be a leak in the heating and air conditioning system in the plant. Aroclor that was in a heat-exchange fluid had leaked out into the effluent ditch and then reached the Escambia River. This was stopped, the source was stopped when this company was notified of the leak.

Since that time we have been conducting laboratory experiments on the effect of PCB's on estuarine organisms and we have conducted a survey recently to again look at the profile of Aroclor 1254 in the bay.

I don't have a prepared statement to give you at this time. I will shortly. But I did pass out to the conferees some maps so that we can discuss the data that we found.

We recently conducted a survey on December 14 to determine the extent of contamination and movement of Aroclor 1254 on the bay system. Figure 1 is a map of Escambia Bay and the surrounding area. In this survey we looked particularly at the water in the sediment. With reference to this map we are talking about the water.

We established about nine transects across the waters of the river and the bay and at each transect we took three stations. We took water samples from the top and the bottom at three different places, one on either bank and one in the center. In this reporting here we lumped together the top samples and the bottom samples for just one bay.

Our first transect was about two miles above the Monsanto Plant and we found no Aroclor 1254 in the surface or bottom water sediments.

At the Monsanto weir in Escambia River we found 0.4 of a part per billion in the surface water and 0.2 in the bottom water.

Fifty yards below this point, 0.5 parts per billion on the surface and it was not detectable in the bottom.

One hundred yards below the weir, the surface 0.1, not detectable on the bottom.

And just about the Highway 90 Bridge we got a trace level at the surface and 0.1 of a part per billion at the bottom.

We also sampled at areas in Escambia Bay and East Bay, at the Pensacola Bay Bridge, and at the inlet, and did not find any traces of Aroclor 1254 in the water.

The next map, this Figure 2, we have plotted the concentration of Aroclor 1254 in sediments in this survey. We collected this. This is surface sediment. We collected it in a pipe-like apparatus that was dragged along the bottom. This is collected at the same transect as the water sample. Again we collected at three points, one on either bank and one in the center of the bay or river.

These are listed in this way on this sheet:

We found no detectable Aroclor 1254 in the transect two miles above the Monsanto plant.

At the weir on the west side going from west to east we found 55.0 parts per million in sediment sample, 0.39 in the center, and 4.0 in the east side.

MR. TRAINA: Excuse me, Tom, you are talking parts per million now? On Figure 1 it was parts per billion.

MR. DUKE: We are talking parts per million. In the water it is parts per billion and in the sediments parts per million.

MR. TRAINA: It is 55.0 parts per million found in the sediments?

MR. DUKE: That is right. That is correct.

At the Highway 90 Bridge we picked up 18.0 parts per million on the west side, 0.21 in the center and 0.42. We did pick up small amounts in upper and lower Escambia Bay. And then coming around to East Bay we found detectable levels in East Bay, and as you notice, we found small or detectable amounts up to about the Blackwater Bay area.

And then the transect at Pensacola Bay Bridge, we picked up 0.17 parts per million at one station there and we did not find any at the inlet.

This next figure, we thought would be interesting to get a depth profile of the amount of this substance in the sediment with depth. These figures that I have here we consider preliminary because we have not run duplicates on them and they are not statistically representative of the situation in the bay, but I present them just to show that it does appear from these first samples that Aroclor is contained in sediments a little deeper than the surface. Just for example, at the weir--this core, by the way, was with an aluminum core about two and a half inches in width, so it is a fairly small core. We went down approximately 18 inches, but we had a glass liner on the inside to eliminate contamination. We took these cores and then after we took the core we extruded the core to determine how much was at each level.

At zero to 2 inches from the surface we had 78.0 parts per million at the weir, 2 to 4 inches 30.0 parts per million, 4 to 6 inches 6.1, and 6 to 8 inches 0.4.

MR. REED: Mr. Chairman, may I interrupt?

MR. WHITE: Yes, Mr. Reed.

MR. REED: Tom, this doesn't sound like a short-term leak to me if we are getting stratification levels like this. This sounds like a long and continued discharge into the bay to build up. Admitted, these are preliminary figures, but this is not--this is a stratification that is deep.

MR. DUKE: I think that these preliminary figures certainly make it worthwhile to make a study of this.

In our report last year we did report levels of PCB. This is in parts per million in some of the biota from the bay. I will just pass on. That is this Table 1, I will just pass on by that, that is in last year's report, just to indicate that the material does get into the biota.

During the past year in this Figure 4 we have a monitoring station in lower Escambia Bay at Devil's Point Light. We collect on a monthly basis, collect oysters from this area and bring them back and determine the amount of Aroclor in the meats of the oyster. Now, this is a composite sample of 1 0 oysters. You can see that in the summer of 1969 we had the greatest level. When the leak was discovered it stopped, you will see a drop.

MR. REED: What month was that?

MR. DUKE: The leak was reported and stopped in August. I cannot explain why it was higher back up in June and July than it was at that time except that that is just the way it occurred. Now, this is August 1969 where it was reported and reached its fairly low level here in October of 1969.

And as you can see, we continue to pick up low levels of this material in oysters and in our last sample of February 1971 we were picking up 0.48 parts per million in oyster meats.

We have run some statistics on this and this is a one standard deviation plus or minus 10 percent, so I think that these comparisons are valid that we have here.

MR. BECK: May I ask, do you have an FDA limit on oyster meat?

MR. DUKE: Yes, there is an action level as there is with pesticides. This action level is 5.0 parts per million.

MR. BECK: Five parts?

MR. DUKE: Five parts per million. The oysters did not exceed that. We are down to 0.4--

MR. REED: Let me just say, John, we do have a restriction in the Florida standards, though, about the release of any deleterious material or any hazardous material. PCB's are in that standard. In fact, there should be none in the water.

MR. DUKE: The next map, indicating that this material is being picked up in the biota, we have some levels reported of shrimp that we have collected. We find that this material is collected in the liver or in the hepatopancreas of the shrimp, it is concentrated there, as opposed to the muscle, the tail. This is fortunate, though, in one way. These levels that are reported here are in the hepatopancreas. We can go in and sample this indicator organism and get a better reading than we can by looking at the whole shrimp.

But the whole shrimp, the muscle part of these shrimp did not exceed 0.3 parts per million. This is in the liver.

MR. REED: What about the total shrimp? If I ate the whole shrimp, I am not going to eat the pancreas, but what if I ate the whole shrimp?

MR. DUKE: The whole shrimp, the highest in 1969 was 14.0 parts per million in one sample of shrimp.

MR. TRAINA: Tom, on these figures, you have figures here of 132 and 120. This again indicates there is a buildup of this material.

MR. DUKE: Yes.

MR. TRAINA: Or doesn't it? I will ask the question, does this indicate that there is a buildup of this material?

MR. DUKE: It does.

MR. TRAINA: It is accumulated over a life cycle?

MR. DUKE: It does, yes.

MR. TRAINA: Let me ask you this, Tom. This material acts like pesticide, I suspect, in that just because you may not succeed in measuring it in the water doesn't mean it doesn't exist in the fish? There is a recycling of this kind of material as there is with pesticides?

MR. DUKE: Well, I think one reason I presented the data on the animals is to illustrate what you are talking about. The water sample that we showed, the profile we did earlier, we see nothing in the water. This is the very worst type of indicator, the water. But go to the sediments and then go to the biota and you find that you will see this even though you don't see it in the water.

MR. TRAINA: Right.

MR. BECK: Did I understand you to say that edible portion of the shrimp is within limits?

MR. DUKE: That is correct.

MR. REED: But you gave me one figure of 14.

MR. DUKE: That was for head and tail, the whole body with the shell and all, whole body. When we looked at the edible portion--

MR. REED: If we shelled him and headed him and tailed him?

MR. DUKE: 1.3

MR. REED: 1.3.

MR. DUKE: This was the highest level that we ever saw in the bay and these levels at this time are lower than that. This was the maximum level.

MR. TRAINA: Does this material change character once it gets into the body of these animals, something like some of the pesticides do?

MR. DUKE: We have seen very little degradation or metabolism, although there is an indication in some of the animals that this could be happening. In our gas-chromatograph analysis we see Aroclor 1254 as five peaks on the graph and the ratio of some of these peaks appear to be changing in some of the animals, indicating that there might be this degradation, although it is very slow.

MR. BECK: I hate to keep coming back to it, but now you say 5.0 parts per million is the FDA standards rather than the 0.5 of a part?

MR. DUKE: It is 5.0 parts.

MR. BECK: Five oh?

MR. DUKE: 5.0 as opposed to 0.5.

MR. BECK: Thank you, sir.

MR. DUKE: I think I will pause here just a minute and say that we have gone along and determined that these residues occur and we, of course, start looking to see what effect this might have on the organisms, and as we went to the literature we found that there was no literature on PCB's, so we have been generating our own. We have been running our own laboratory tests, and we have been in contact with other EPA laboratories, water quality laboratories, that are doing this type of work and with Fish & Wildlife Service labs to keep up with what is going on, because we are having to generate our data at this time.

Our studies to this point have been mainly in the laboratory trying to set limits where we have shown that, for example, 5.0 parts per billion of Aroclor 1254 in the water and constantly in the water in solution will kill shrimp in 21 days. We have worked with oysters and fish and we are getting this kind of data. The problem now, of course, is to get from the laboratory and extrapolate to the field, so I think now we are in a position to move into the field to do some work in the bay and to perhaps be able to extrapolate from the laboratory to the field.

MR. TRAINA: Tom, are we going to have the same problem here as we did with mercury in that the stuff once it gets in the sediments is going to be there a long time? How fast will it degrade, in your estimation?

MR. DUKE: Mr. Traina, with the gas-chromatograph analysis we have not seen degradation in the sediment. Before I would say this, I would certainly want to ask you people to look at the mass spec. to see if you are getting degradation.

Unfortunately, it is just this last December that we have set up samples, transects, so we can go back to the same place, pretty near the same place, and get our samples. It appears that the PCB varies with the type of bottom; that is, there is more in silt than there is in sand, for example. So if we get a silt sediment today and analyze it, we can't compare it with a sandy sediment that we got a year ago.

But I think now we are in a position to do what you are saying, to see if we are getting degradation moving out. We have not done a good statistical analysis. It appears from our first grab samples that it is less in the sediment now than it was at the time it was stopped.

MR. TRAINA: I am just thinking out loud here that perhaps this ban on dredging is more important than we think.

MR. DUKE: I was thinking that myself.

Mr. Chairman, we don't feel that PCB's alone have caused or are causing the fish kills that we see in Escambia Bay, but it is a toxic material and it is there. It should be watched and we should be concerned.

MR. REED: It should not be in the bay, Tom. It is well covered in the Florida standards and it shouldn't be there.

MR. DUKE: One reason we have been concerned is that there seemed to be an input into the system even though the leak was stopped, and this presumably is from leaching in the Escambia River, and--

MR. REED: Our enforcement section will be talking about that later today.

MR. DUKE: I was going to say that the State of Florida will bring this up later, so I will conclude my comments.

MR. WHITE: Thank you very much, Dr. Duke, for a very good presentation.

MR. REED: I would like all of Dr. Duke's charts and tables in the record.

MR. WHITE: Yes, we will enter them in the record.

MR. TRAINA: As a matter of fact, you have a statement to go along with this, Tom. Do you want that also in the record?

MR. DUKE: That is not really the statement. I just wrote that for your guideline and I would like to get that statement to you just shortly.

MR. TRAINA: In other words, you don't want the written portion in the record now?

MR. DUKE: That is right. The maps I do.

MR. WHITE: You will provide us with a completed statement?

MR. DUKE: Right.

MR. WHITE: O. K., thank you.

MR. TRAINA: Dr. Duke, thank you a lot. That was a very good presentation.

(The statement and charts referred to follow:)

ENVIRONMENTAL PROTECTION AGENCY
GULF BREEZE LABORATORY
SABINE ISLAND
GULF BREEZE, FLORIDA 32561

The Environmental Protection Agency Laboratory at Gulf Breeze, Florida continues to monitor the biota, sediment, and water for Aroclor® 1254 and to conduct laboratory and field tests to determine the effect of this polychlorinated biphenyl (PCB) compound on estuarine organisms. As reported in the 1970 Escambia Bay Enforcement Conference Proceedings, we traced one source of this chemical to an accidental leak in a heat-exchange system at the Monsanto Chemical Plant located on the Escambia River. Aroclor 1254 entered Escambia River at the Monsanto weir, was carried downstream and is now in biota and sediment of Escambia Bay and contiguous waters. The source of the leak was stopped when Monsanto was notified of the problem in August, 1969. However, recent surveys show low levels of Aroclor 1254 (0.5 to 3 parts per billion) still entering the river at the weir. Presumably, these low levels are being leached from sediment.

Surveys

A survey was conducted on December 14, 1970 by our laboratory. to ascertain the extent of contamination and movement of Aroclor 1254 in the estuary. The results of this survey are shown in Figures 1, 2,

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and 3. Evidently, at the time of the survey, the chemical was still leaching from the sediments and entering Escambia River near the weir. Concentrations in the water directly below the weir ranged from 0.4 part per billion (ppb) on the surface to 0.2 ppb on the bottom (Figure 1). Aroclor 1254 was detected in surface water 100 yards below the weir and in trace amounts (0.03 - 0.05 ppb) in both surface and bottom water collected above Highway 90 bridge, and also at Buoy 16 in upper Escambia Bay. This chemical was not detected in water collected from any other portion of the estuary in this survey.

Concentrations of Aroclor 1254 in sediments also indicate that a source of PCB was near the Monsanto weir (Figure 2). Maximum concentrations of the chemical in sediments taken at the transects indicated in Figure 2 were 55.0 parts per million (ppm) at the weir, 18.0 ppm at Highway 90 bridge and 7.2 ppm at Buoy 16. However, the data show that Aroclor has been dispersed to many other areas of the estuary, including Blackwater, East, and Pensacola Bays. Residues seem to be higher in silt materials than in sand. Residues in cores taken in this survey (Figure 3) indicate the material was deposited in the sediments of the upper (Escambia) Bay.

Certainly the biota are concentrating Aroclor 1254 in their tissues. Table 1, submitted at last year's conference, shows the concentrations of the chemical in biota of Escambia Bay and River. Concentrations are higher in the crustaceans and the highest level of all occur in the fish -- especially in the liver of flounder. This may indicate a trend toward accumulation and concentration of Aroclor 1254 in the higher trophic levels.

Even though the major source of the chemical was halted, residues continue to be found. Possibly, leaching of Aroclor 1254 from the sediments or movement of silt particles with attached Aroclor 1254 molecules result in availability of the chemical to animals living on the substrates. Figure 4 shows monthly variation in concentration of Aroclor 1254 in oysters sampled at Devil's Point Light. Residues in these molluscs may be decreasing, but there are indications that an apparent equilibrium has been reached between accumulation and loss of the chemical.

The availability of Aroclor 1254 to other animals that live on sediment substrates is reflected in the concentrations of shrimp hepatopancreas (Figure 5). These collections from 1969-70 include individuals of three major commercial species. Whole-body residues never exceeded 14.0 ppm, but residues in the hepatopancreas (the organ of greatest concentration) of brown shrimp (*Penaeus aztecus*) reached 132.0 ppm. Greater amounts were found in shrimp captured in upper Escambia Bay, but shrimp in Penscola Bay also had measurable amounts. This indicates one manner in which Aroclor is dispersed and translocated in the ecosystem.

Effects

We are investigating the effects of Aroclor 1254 on organisms that represent many different trophic levels. Some results that are available at this time are shown in Tables 2 and 3. Chronic bioassays conducted on pink shrimp (Penaeus duorarum) (Table 2) have shown that this commercial species is sensitive to concentrations from 1 to 20 ppb in the water. Adult shrimp are more resistant to the chemical than juveniles, the latter showing significant mortality after 15 days when exposed to 1.0 ppb Aroclor 1254 in the water. Two species of fish showed significant mortality after continuous exposure to 5.0 ppb or less (Table 3).

Most of our studies on effects have been conducted under controlled conditions in the laboratory. Since it is difficult to extrapolate data obtained in the laboratory to conditions in the field, we will be conducting experiments in Escambia Bay and surrounding waters. These experiments will involve shrimp in sensitive stages of development.

Thomas W. Duke
Laboratory Director

Table 1. Residues of Aroclor ® 1254 in samples from Escambia Bay and River

Sample (shrimp collected live; crab and fish were dead or moibund) *	Number of animals or organs in sample	Date collected (D-M-Y)	Location	Residues of Aroclor 1254 parts per million
Fish				
Flounder liver	1	5-6-69	Mulatto Bayou	76.
Flounder muscle	1	"	"	4.5
Flounder gills	1	"	"	19.
Croaker	3	"	"	12.
Menhaden	5	"	"	11.
Pinfish	5	"	"	10.
Menhaden	5	1-7-69	"	12.
Speckled trout gills	1	14-8-69	Pensacola Bay	7.5
Speckled trout liver	1	"	"	21.
Speckled trout	3	31-8-69	Northern Escambia Bay	20.
Flounder liver	1	"	"	184.
Menhaden	6	10-10-69	Mulatto Bayou	5.7
Crustaceans				
Shrimp	10	1-7-69	Mulatto Bayou	1.5
Shrimp	5	31-8-69	Northern Escambia Bay	2.5
Blue crab	6	13-8-69	"	7.0
Blue crab	5	31-8-69	"	6.3
Blue crab	6	9-9-69	Mulatto Bayou	1.0
Sediment				
"		8-7-69	Highway 90	1.7
"		15-8-69	Garcon Point	< 0.03
"		"	Monsanto weir	486.

* Scientific names: trout (*Cynoscion nebulosus*), croaker (*Micropogon undulatus*), menhaden (*Brevoortia patronus*), pinfish (*Lagodon rhomboides*), flounder (*Paralichthys* sp.), shrimp (*Penaeus setiferus*) and (*Penaeus aztecus*), and blue crab (*Callinectes sapidus*).

From: Duke, T. W., et al.
Bulletin of Environmental
Contamination and
Toxicology
5: 171-180 (1970)

Table 2. Results of chronic bioassays with Aroclor® 1254 and pink shrimp (Penaeus duorarum) (flowing-water)

Shrimp lengths rostrum-telson in cm	Concentration (ppb) desired	Concentration (ppb) measured*	Avg. S‰	Avg. temp. C	No. of test animals	Repli cates	Days exposed	Avg. mortality %	Level of significance
2.5-3.8	Control		32	29	65	5	15	12	--
"	0.5	0.57	"	"	20	2	"	30	0.10 [1]
"	1.0	0.94	"	"	45	3	"	51	0.005 [1]
"	10.0	9.4	"	"	20	2	"	90	0.001 [1]
"	20.0	19.0	"	"	20	2	"	100	0.001 [1]
4.2-7.2	Control		29	28	25	1	32	4	--
"	2.0	2.4	"	"	20	1	17	65	0.001 [2]
"	4.0	3.1	"	"	25	1	32	80	0.001 [2]
6.6-9.0	Control		29	20	43	1	53	26	--
"	5.0	4.3	"	"	46	1	53	83	0.001 [2]
7.6-8.5	Control		31	29	60	1	18	9	--
"	5.0	4.0	"	"	"	1	18	41	0.001 [2]
9.5-12.5	Control		28	20	50	1	35	8	--
"	5.0	3.5	"	"	"	1	35	50	0.001 [2]

* Average of at least three determinations

[1] Student's "t" test

[2] Chi-Square

From: D. R. Nimmo
Environmental Protection Laboratory
Gulf Breeze, Florida 32561

Table 3. Test conditions, mortality of fishes, and uptake of Aroclor® 1254 in flowing water bioassays

Fish	SL (mm)	Number* Exposed	Concen- tration	Mortality **			Days Exposed	Aroclor 1254 (ppm) *** in fish after exposure	Water Temper- ture, °C	Salinity, ‰
				25% Day	50% Day	Terminal Percent				
Spot	25	150	1 ppb	--	--	17	33	17	14-16	16-32
Spot	40	150	1 ppb	--	--	1	56	27	23-32	10-34
Spot	24	50	5 ppb	12	18	51	20	46	11-18	16-32
Spot	24	300	5 ppb	23	26	53	26	120	8-10	20-32
Spot	74	50	5 ppb	28	38	62	45	152	28-33	23-34
Pinfish	30	50	5 ppb	9	12	66	14	14	16-22	20-32
Pinfish	27	54	5 ppb	17	--	41	35	109	22-32	14-34

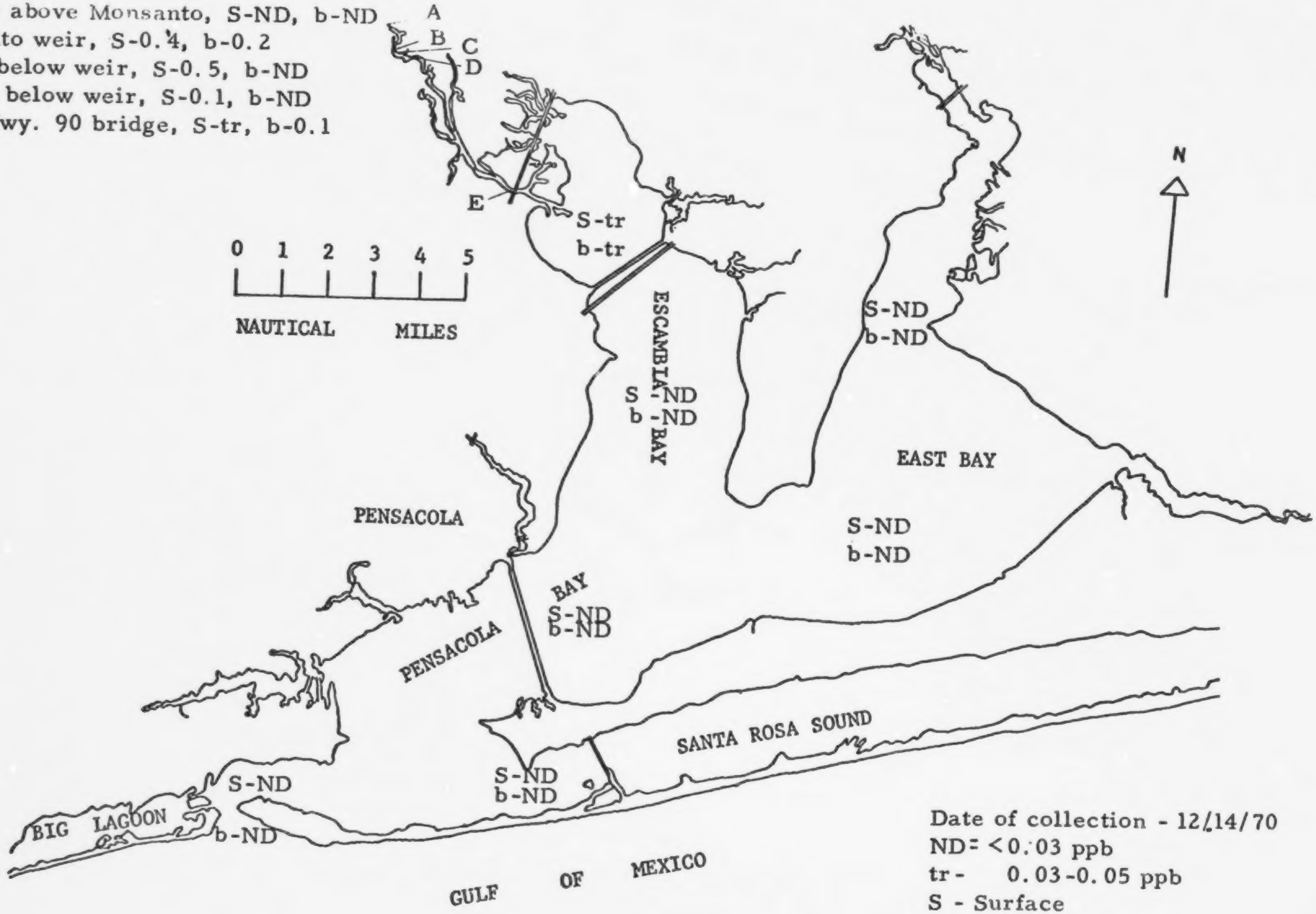
* An equal number of fish were held in control aquaria. Control mortality never exceeded 7%.

** Mortality of spot exposed to 5 ppb Aroclor was significantly greater in all tests ($p < .001$) than that of control fish (χ^2 values were all greater than 10.83).

*** milligrams per kilogram

From: Hansen, D. J., et al.
Bulletin of Environmental
Contamination and Toxicology
(in press)

Figure 1. Concentrations of Aroclor® 1254 in water [illegible] from Pensacola Estuary expressed in parts per billion (ppb)

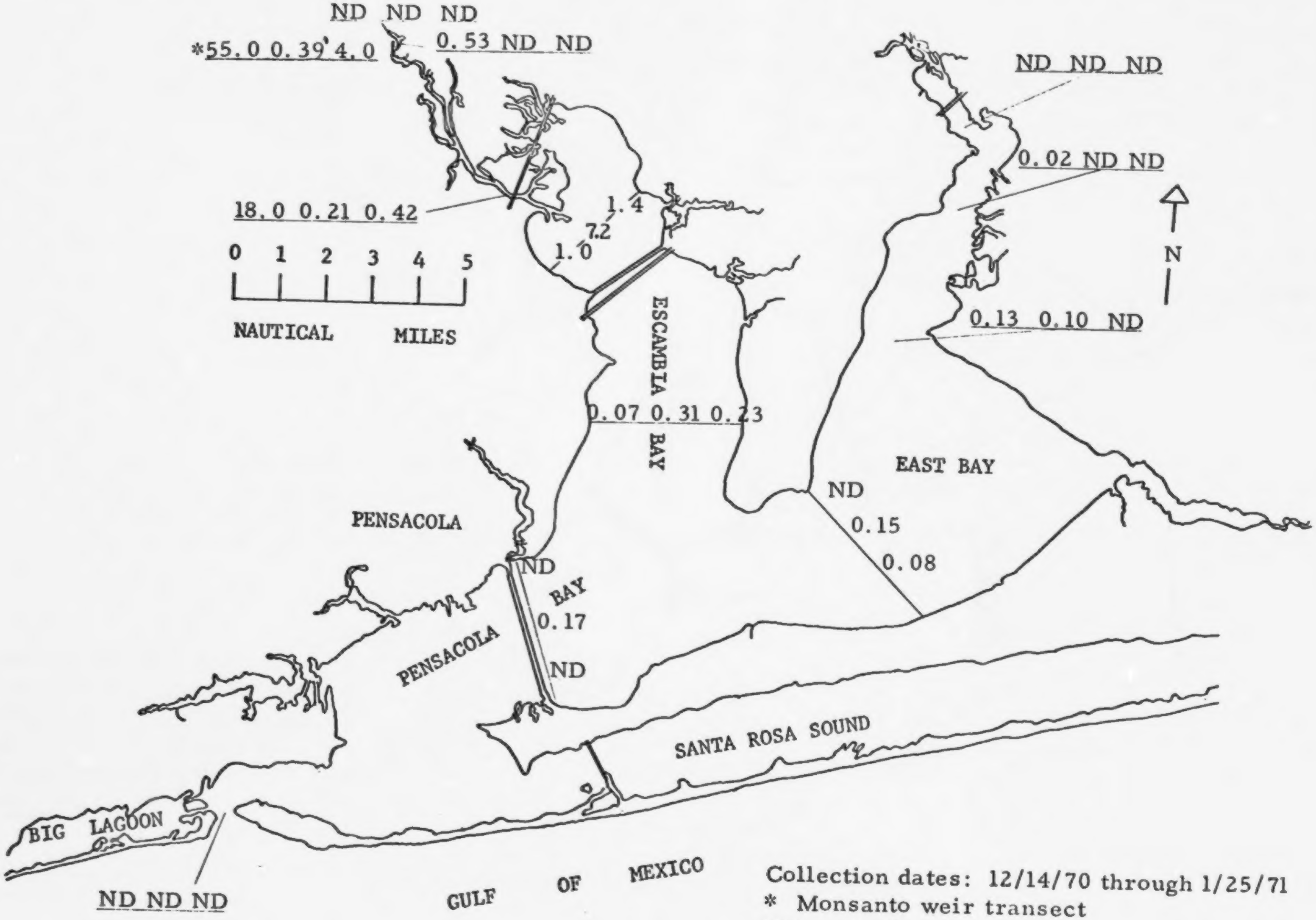

A
B
C
D
E
S-tr
b-tr
0 1 2 3 4 5
NAUTICAL MILES
N
ESCAMBIA BAY
S -ND
b -ND
S-ND
b-ND
EAST BAY
S-ND
b-ND
PENSACOLA
PENSACOLA BAY
S-ND
b-ND
SANTA ROSA SOUND
S-ND
b-ND
S-ND
b-ND
BIG LAGOON
GULF OF MEXICO

Location

A. 2 miles above Monsanto, S-ND, b-ND
B. Monsanto weir, S-0.4, b-0.2
C. 50 yd. below weir, S-0.5, b-ND
D. 100 yd. below weir, S-0.1, b-ND
E. Above Hwy. 90 bridge, S-tr, b-0.1

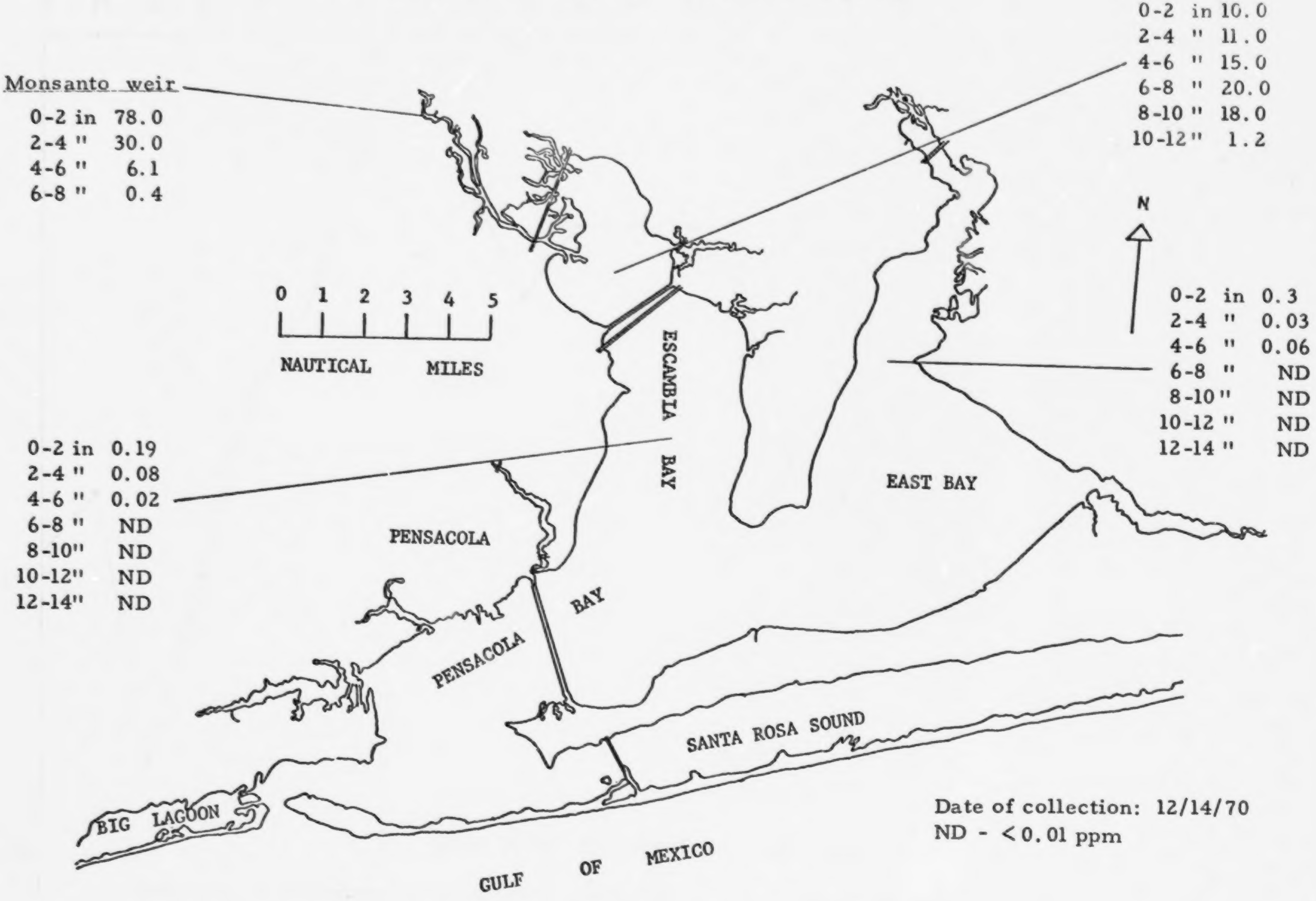
Date of collection - 12/14/70
ND= <0.03 ppb
tr - 0.03-0.05 ppb
S - Surface
b - Bottom

Figure 2. Concentrations of Aroclor^{R} 1254 in sediments from Pensacola Estuary expressed in parts per million (ppm)


ND ND ND
*55.0 0.39 4.0
0.53 ND ND
18.0 0.21 0.42
1.4
7.2
1.0
0 1 2 3 4 5
NAUTICAL MILES
ESCAMBIA BAY
0.07 0.31 0.23
ND ND ND
0.02 ND ND
N
0.13 0.10 ND
EAST BAY
ND
0.15
0.08
PENSACOLA
ND
BAY
0.17
PENSACOLA
ND
SANTA ROSA SOUND
BIG LAGOON
ND ND ND
GULF OF MEXICO

Collection dates: 12/14/70 through 1/25/71
* Monsanto weir transect
ND = <0.01 ppm

Figure 3. Concentrations of Aroclor®1254 in sediment cores from Pensacola Estuary expressed in parts per million (ppm)


Monsanto weir
0-2 in 78.0
2-4 " 30.0
4-6 " 6.1
6-8 " 0.4
0-2 in 10.0
2-4 " 11.0
4-6 " 15.0
6-8 " 20.0
8-10 " 18.0
10-12" 1.2
N
0 1 2 3 4 5
NAUTICAL MILES
0-2 in 0.3
2-4 " 0.03
4-6 " 0.06
6-8 " ND
8-10" ND
10-12 " ND
12-14 " ND
ESCAMBIA BAY
0-2 in 0.19
2-4 " 0.08
4-6 " 0.02
6-8 " ND
8-10" ND
10-12" ND
12-14" ND
EAST BAY
PENSACOLA
BAY
PENSACOLA
SANTA ROSA SOUND
BIG LAGOON
GULF OF MEXICO

Date of collection: 12/14/70
ND - < 0.01 ppm

Figure 4. Concentrations (in parts per million) Aroclor® 1254 in oysters at Devil's Point Light, Escambia Bay, 1969-1971

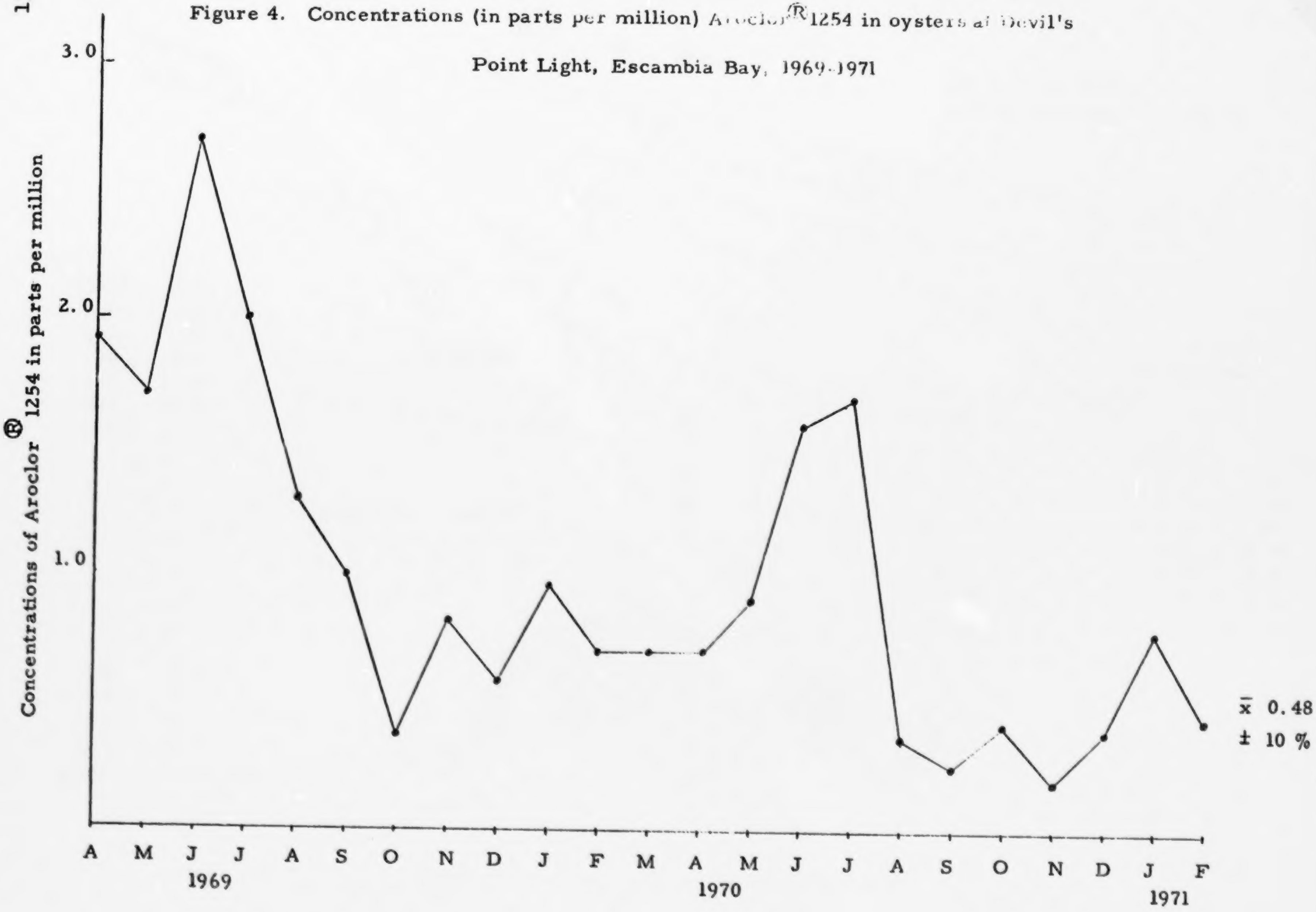
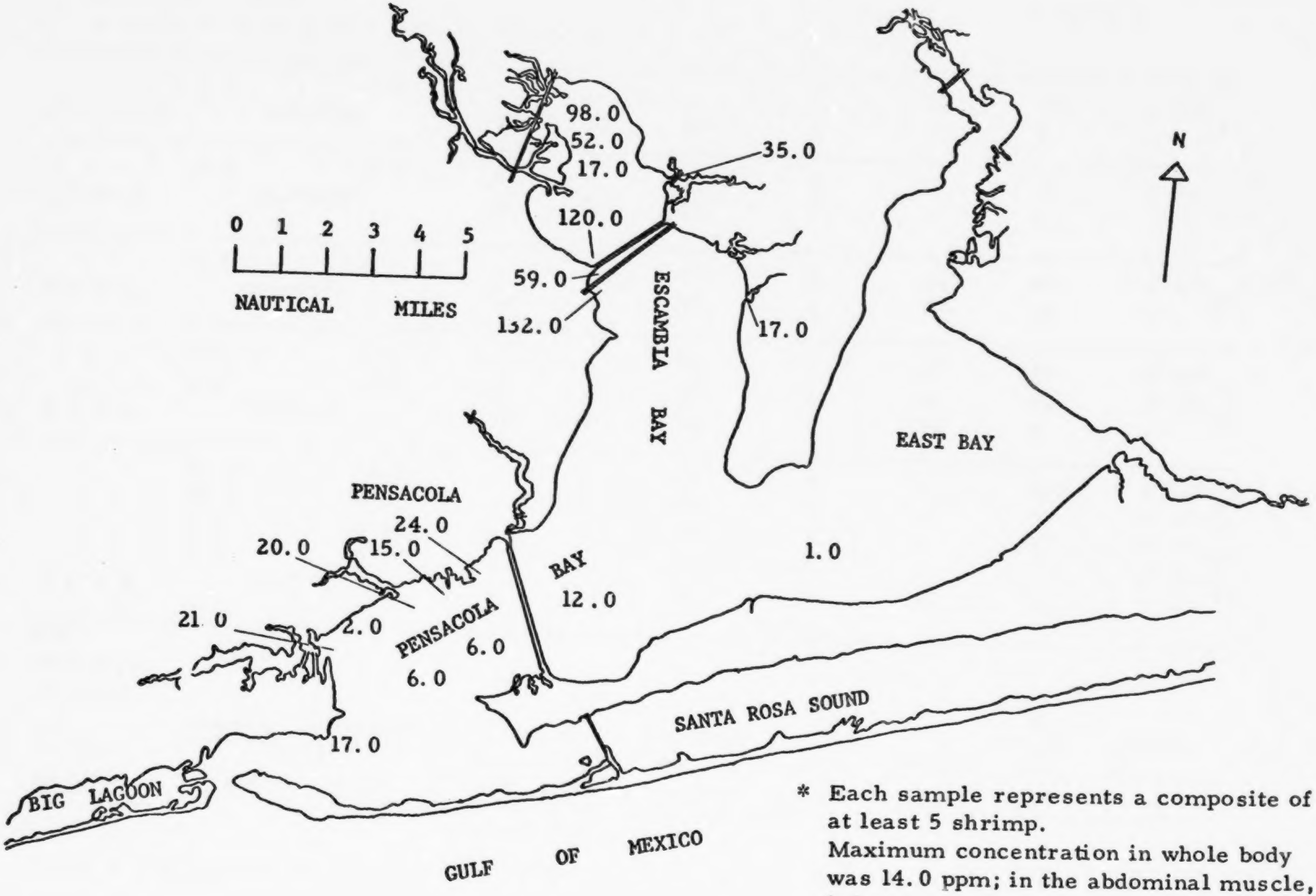


Figure 5. Concentrations of Aroclor® 1254 in the hepatopancreas of shrimp collected from Pensacola Estuary expressed in parts per million (ppm) 1969-1970 *


98.0
52.0
17.0
35.0
120.0
59.0
132.0
17.0
0 1 2 3 4 5
NAUTICAL MILES
N
ESCAMBIA BAY
EAST BAY
PENSACOLA
24.0
20.0
15.0
21.0
2.0
PENSACOLA
BAY
12.0
1.0
6.0
6.0
17.0
SANTA ROSA SOUND
BIG LAGOON
GULF OF MEXICO

* Each sample represents a composite of at least 5 shrimp.
Maximum concentration in whole body was 14.0 ppm; in the abdominal muscle, 1.3 ppm.

Table 2. Results of chronic bioassays with Aroclor® 1254 and pink shrimp (Penaeus duorarum) (flowing-water)

Shrimp lengths rostrum-telson in cm	Concentration (ppb) desired	Concentration (ppb) measured*	Avg. S‰	Avg. temp. C - -	No. of test animals	Repli cates	Days exposed	Avg. mor-tality %	Level of signi-ficance
2.5-3.8	Control		32	29	65	5	15	12	--
"	0.5	0.57	"	"	20	2	"	30	0.10 1/
"	1.0	0.94	"	"	45	3	"	51	0.005 1/
"	10.0	9.4	"	"	20	2	"	90	0.001 1/
"	20.0	19.0	"	"	20	2	"	100	0.001 1/
4.2-7.2	Control		29	28	25	1	32	4	--
"	2.0	2.4	"	"	20	1	17	65	0.001 2/
"	4.0	3.1	"	"	25	1	32	80	0.001 2/
6.6-9.0	Control		29	20	43	1	53	26	--
"	5.0	4.3	"	"	46	1	53	83	0.001 2/
7.6-8.5	Control		31	29	60	1	18	9	--
"	5.0	4.0	"	"	"	1	18	41	0.001 2/
9.5-12.5	Control		28	20	50	1	35	8	--
"	5.0	3.5	"	"	"	1	35	50	0.001 2/

* Average of at least three determinations

1/ Student's "t" test

2/ Chi- Square

From: D. R. Nimmo
Environmental Protection Laboratory
Gulf Breeze, Florida 32561

Table 3. Test conditions, mortality of fishes, and uptake of Aroclor® 1254 in flowing water bioassays

Fish	SL (mm)	Number* Exposed	Concen-tration	Mortality ** 25% Day	Mortality ** 50% Day	Mortality ** Terminal Percent	Days Exposed	Aroclor 1254 (ppm) *** in fish after exposure	Water Temper-ture, °C	Salinity, ‰
Spot	25	150	1 ppb	--	--	17	33	17	14-16	16-32
Spot	40	150	1 ppb	--	--	1	56	27	23-32	10-34
Spot	24	50	5 ppb	12	18	51	20	46	11-18	16-32
Spot	24	300	5 ppb	23	26	53	26	120	8-10	20-32
Spot	74	50	5 ppb	28	38	62	45	152	28-33	23-34
Pinfish	30	50	5 ppb	9	12	66	14	14	16-22	20-32
Pinfish	27	54	5 ppb	17	--	41	35	109	22-32	14-34

* An equal number of fish were held in control aquaria. Control mortality never exceeded 7%.

** Mortality of spot exposed to 5 ppb Aroclor was significantly greater in all tests ($p < .001$) than that of control fish (χ^2 values were all greater than 10.83).

*** milligrams per kilogram

Hansen, D. J., et al.
From: Bulletin of Environmental
Contamination and Toxicology
(in press)

MR. TRAINA: We have Mr. Woodrow L. Lynn, Head of the Engineers Department with the U. S. Navy.

Mr. Lynn.

WOODROW L. LYNN
HEAD OF ENGINEERING DEPARTMENT
PUBLIC WORKS CENTER (NAVY)
PENSACOLA, FLORIDA

MR. LYNN: Mr. Chairman, conferees, ladies and gentlemen.

The Southern Division of Naval Facilities Engineering Command was invited to the conference. I am here representing them.

The Navy is not really, I hope, involved in the Escambia Bay problem. The only installation we had was Naval Air Station Ellyson, which more than a year ago we tied into the city's sewage treatment plant and abandoned our sewage treatment plant at that point.

We have at the Naval Air Station, Pensacola, an effluent going into Pensacola Bay which I suppose by tidal waters could affect Escambia Bay. In that location we have an industrial waste treatment plant being constructed which is to be placed in operation about March 1, next week. This plant is designed to take from the bay those wastes of chromium, cyanide, paint stripping and oils that were produced by the overhaul of aircraft in our naval air rework facility. As I say, that plant goes into operation next week.

Under construction we have a secondary treatment plant for our sanitary sewage which is planned for completion the 1st of August of 1971, which will bring our sanitary wastes up to State standards. The effluent for both the industrial wastes and the sanitary wastes, as I say, do go into Pensacola Bay and will continue to go into Pensacola Bay when these plants are completed.

The only other facility we have that may come under question is that at the Naval Communication Training Center Corry, where there is a plan to construct a 310-bed hospital. If and when this hospital is constructed, we will have to either construct a new sewage treatment plant or tie into the city of Pensacola. We have in budget planning, our 5-year program, a plan for constructing a new plant with a budget request for the funds. If and when that hospital is built, we will either build a new plant or more desirably negotiate with the city of Pensacola to tie that waste into the city's plant by constructing a line from Corry into the Pensacola plant.

I believe that covers about all of the facilities that we have that could affect either one of these bodies of water and brings up to date the report that Mr. Bair made at the last meeting for the Naval Facilities Engineering Command in Charleston.

MR. WHITE: Thank you very much, Mr. Lynn.

Are there any comments or questions?

MR. REED: Mr. Lynn, I do want to reiterate the State's position on industrial wastes leaving the air field of the Pensacola Naval Air Station. I believe that substantial improvement has been made in the methods that the Navy is using to handle these wastes, but I again wish to recommend that this be carefully analyzed and carefully watched, as this was not only a potential source of pollution; it was a very real source of pollution principally through sloppy maintenance. I believe much has been done by the Base Commander and by the Executive Officer to see that this program has gone well towards completion. We are very happy with that work, but an eagle eye should be kept on it, obviously.

MR. LYNN: I appreciate your remarks. We have a plant set up to watch it.

MR. TRAINA: Thank you again, Mr. Lynn.

That concludes, Mr. Chairman, the Federal presentations, unless there are any other Federal agencies present I don't know about who would like to make a statement at this time.

MR. REED: Mr. White, I think there is one thing we might do if we are at the end of the Federal presentation, we might take a 5-minute break to see if we can find the heating panel.

MR. WHITE: Very good, Mr. Reed. I think that is a good idea. We will recess for 5 minutes.

(RECESS)

MR. WHITE: Next I would like to call on Mr. Reed for the Florida presentation.

Mr. Reed.

MR. REED: As host, I do want to turn it over to our sister State, Alabama, to proceed.

Would you like that, Arthur, or would you like for us to proceed? Whatever you like.

MR. BECK: Let's go ahead with the plan, if you don't mind, Mr. Reed.

MR. REED: Fine. No problem.

I would like to recognize some people in the room. They won't be speaking, but I would like to recognize their presence for the record.

County Commissioner Sam Armour is here.

Mr. Bjarne Andersen, Assistant Attorney General of the State of Florida, is here.

Lt. Zangas from the Department of Natural Resources is here.

We welcome all three of them.

As our first speaker I will ask Mr. Tom Webb, Director of Administration, Department of Transportation, to give a presentation.

TOM WEBB
DIRECTOR OF ADMINISTRATION
FLORIDA DEPARTMENT OF TRANSPORTATION
TALLAHASSEE, FLORIDA

MR. WEBB: Mr. Chairman, conferees, ladies and gentlemen.

I am Tom Webb, Director of Administration for the Department of Transportation, speaking for Mr. Miller, the Secretary.

The Florida Department of Transportation plans to determine its responsibility for ecological damage resulting from dredging operations in Mulat-Mulatto Bayou and steps to be taken to restore the environment if possible.

In dredging fill for the construction of Interstate 10, bridge material was taken from the Mulat-Mulatto Bayou at a site which opened a new channel between the bayou and Escambia Bay. The dredged area in some places was as much as 20 feet. This alteration in the topography of the bayou and bay is thought to have adversely affected the natural flushing and exchange process of the bayou. Eutrophication is said to have occurred and may have been the cause of severe and extensive fish kills. The Department of Transportation has no desire to avoid any responsibility for its action and every attempt is and will be made by the agency to determine the extent of that responsibility.

This past summer, in cooperation with the Air & Water Pollution Control Board, the Department constructed air screens across both entrances to this bayou. We plan to provide these screens again this coming summer if it is desirable to do so.

The Department in this past year also had an engineering study carried out to determine the volume of dirt which would be necessary to fill the borrow site and the new canal that was constructed in conjunction with the Interstate. This volume of material is approximately 500,000 yards, this depending on its depth. The cost of providing fill to fill up the borrow site would be from $300,000 to $500,000 if this is a desirable process.

We are entering into a contractual agreement between the Department and a marine biologist, Dr. Robert Livingston, of Florida State University, for a study in cooperation with Dr. Tom Hopkins of the University of West Florida to determine scientifically what our pollution liability is and what steps should be taken to rectify it.

Dr. Livingston and Dr. Hopkins will function as independent scientific advisers to the Department in this matter. They will conduct the study without prejudice for or against the Department and with complete freedom to arrive at fair and equitable conclusions concerning the degree of implication of the Department. They anticipate it will take a year to arrive at a reasonable appraisal.

They will use every means possible to arrive at these conclusions and will make recommendations for the planning and execution of any operations necessary to the successful termination of the project.

The area under study will be monitored separately and in conjunction with other ongoing studies. Water quality data will be examined in order to make the proper evaluation for a future course of action.

This study team will confer with experts in this area and the data obtained from these sources, together with studies already made and studies which will be made, will allow a meaningful evaluation of the responsibilities of the Department.

Mr. Chairman.

MR. REED: Tom, I want to thank you publicly and personally for such a fine report. It has been my pleasure to have been associated with the Department of Transportation, State of Florida, now for some four years three months, and I just want to tell you that during that period the degree of cooperation that I and the Department have received has increased by the month. I can with pride say that of all the DOT's in the Nation that I am aware of, and I am aware of a lot of them, I am the proudest of ours.

I am delighted you are going ahead with the study. I think you will find that the hole is more than 20 feet deep. I think you are going to find it drops down to a depth of 40, 50 or perhaps 70 feet.

I want to publicly again thank you for the enormous amount of work involved in setting up the air barriers last summer. Had man not interfered with your operation, we would have minimized the kills in Mulat Bayou. It is practically a disgrace to consider the wanton vandalism that occurred to your property when you were attempting to prohibit fish kills in this part of Florida and it is very discouraging.

I would like to offer to you the assistance of the regional office of the Department of Air & Water Pollution Control under our Regional Director, Mr. Phil Doherty, to give you any assistance with the Livingston-Hopkins team's efforts in Mulat Bayou. You can call on them for any assistance and you can count on receiving it. We shall be very pleased to hear the results of this survey.

Again, Tom, my thanks for coming and bringing us such an excellent report.

MR. WEBB: Thank you, sir.

MR. WHITE: I would like to thank you also, Mr. Webb, and ask any of the other conferees if they have any comment or question?

MR. TRAINA: I do.

Mr. Webb, when do you expect to get the results of the study?

MR. WEBB: In approximately a year from now.

MR. TRAINA: I hate to put deadlines on people, but is there any way of getting that a little earlier so that maybe we can make some decisions on this?

MR. REED: If we could get it later next fall, it would give us the winter period to determine a course of action before the critical summer of 1972. Any work we can do in the winter months of 1972 prior to the summer months would be to our advantage.

MR. WEBB: Yes, sir.

MR. REED: Or would be to the advantage of the bay.

MR. WEBB: In speaking with Dr. Livingston this morning, he is of the opinion it will take this long and he needs a year's cycle.

MR. REED: All right. Whatever can be done, recognizing that the year cycle is important, I am sure, to give us an opportunity of doing corrective--if they perceive corrective measures being conceived of prior to that, I hope they will consider them, because the key period would be if we can do work in the winter of 1972 to prevent a massive fish kill again in 1973.

But I am very heartened by this expression of interest by the Department.

MR. WEBB: Thank you.

MR. WHITE: Thank you, Mr. Webb.

MR. REED: Mr. Chairman, I will now turn our presentation over to Mr. Patton, who will call his two ranking members of his staff.

MR. PATTON: First I would like to call on Mr. Huffstutler, Chief of the Bureau of Surveillance, to give a report on activities encompassing everything except enforcement.

Mr. Huffstutler.

K. K. HUFFSTUTLER, CHIEF
BUREAU OF SURVEILLANCE
FLORIDA DEPARTMENT OF AIR
& WATER POLLUTION CONTROL
TALLAHASSEE, FLORIDA

MR. HUFFSTUTLER: Mr. Chairman, members of the conference. I am K. K. Huffstutler, Chief of the Bureau of Surveillance, Florida Department of Air & Water Pollution Control.

The following information is presented as a progress report. Emphasis is placed upon the recommendations developed by the conferees as a result of the January 20, 1970, conference, but comments on satellite activities pertaining to the conference and Escambia River and Bay will also be included.

As the Department's Enforcement Section will report, legal action has been taken against American Cyanamid, Escambia Chemical Corporation, and Monsanto Company. The city of Pensacola was excluded from legal action because they were well into a pilot study for nutrient removal at the Northeast Sewage Treatment Plant at the time that legal action seemed appropriate. In addition, consideration was given to the low concentrations of nutrients in the treated effluent.

Another exemption is that carbonaceous material was not included in the Department's Notice and Order. The primary reason is that Florida has no laws or regulations pertaining to carbons upon which an order could be based. It was also the consensus of the Department's staff that the present data and information on carbonaceous material is too limited to utilize this parameter as a legal tool.

Legal action on the other parameters has adequately satisfied the intent of Recommendation No. 1.

With respect to the alternate of accomplishing the removal of nutrient materials via sewage collection systems surrounding Escambia Bay, it is our opinion this alternative does not justify detailed investigation at this time. This conclusion could be modified if consideration were given to an interceptor system along the Escambia County side alone. The physical characteristics of the shoreline and adjacent land areas on the Santa Rosa side of the Bay, together with the problem of either pumping material to the north end of the Bay and thus down the Escambia County side, or constructing an underwater discharge line either south to the mainland of the Santa Rosa peninsula, or west across the Bay to the Escambia side, indicates that the cost would be prohibitive, especially when the quantity of material collected and transported is considered. The predicted growth of the Santa Rosa side does not indicate that sufficient waste material would be available for collection to offset enough of the excessive cost involved. In addition it appears waste characteristics of the two industrial sources are such that they will not have a mutually compatible solution.

The physical land characteristics on the Escambia County side of the Bay are such that the prospects of an interceptor line on that side are somewhat discouraging. The planning authority and various consultants in the field seem to be prone to a collector system further inland in order to collect waste from existing and future populations. The important thing to point out is that basic decisions regarding the wastewater control strategy for the area must be made. Activities are currently under way both at the State and local levels to accomplish this purpose.

Recommendation No. 3, having to do with the color of Escambia River at State Road #4 near Century, Florida, will undoubtedly receive comment from the Alabama authorities.

As an experiment in updating Florida's method of collecting and analyzing data, we have arranged to have the EPA's monitoring device located at Century, Florida, modified and interfaced to transmit its data to our office in Tallahassee via telephone lines. This experiment was placed in operation November 1970. Since that time, Tallahassee has received dissolved oxygen, temperature, pH and conductivity on an hourly basis with an accumulated average of each parameter starting at midnight each day. The only abnormal data received thus far occurs when maintenance personnel clean the probes and other pertinent apparatus. Unfortunately, the turbidity and color are not done automatically; therefore, we are unable to comment upon the acceptability of these parameters at the State line.

Recommendation No. 4 had to do with the moratorium on dredging operations and the establishment of a shoreline. Only one dredging operation has taken place since the January 1970, conference and this was only after a hearing by our Board, much investigation by our staff, and the agreement by the permit holder to comply with certain rigid operation procedures. The Department and University of West Florida staff continuously monitored the dredging operation to determine if any rules and regulations were violated or adverse effects resulted, and if so, to what degree. All regulations were met. However, the ultimate after-effects of this operation are still being documented.

As required by Florida law, it is necessary for the county or counties involved in an estuarine body of water to establish the shoreline as a guide for all dredging and filling and related construction activities. In response to the conferees' recommendation, the State Cabinet, sitting as the Florida Board of Trustees for the Internal Improvement Trust

Fund, adopted a policy of prohibiting construction, dredging, etc., and placing limits on deposition of dredge material. On April 28, 1970, the Internal Improvement Board staff requested the respective Commissions of Escambia and Santa Rosa Counties to establish a shoreline in Escambia Bay. As of February 17, 1971, neither County has responded to the request of the Internal Improvement Board. Therefore, nothing has been done toward fulfilling this portion of the conferees' recommendation.

Recommendation No. 5 had to do with removal of the pilings and surplus material from the Louisville-Nashville Railroad Company trestle. Early in January 1971 L&N reported that a total of 2,052 pilings had been removed. This virtually completes the removal of excessive pilings from 740 of the total 840 spans in the trestle. This is equivalent to the removal of 5,200 square feet of obstructive cross-sectional area. This project is now complete.

Recommendation No. 6 pertaining to American Cyanamid and the cessation of the discharge of acrylonitrile will be discussed by our Enforcement Section and probably the company.

Recommendation No. 7 had to do with heat discharges from Monsanto Company and Gulf Power Company's operations on the lower Escambia River. Fulfillment of this particular recommendation has developed some difficulties.

There have been three recent thermal surveys conducted on the lower Escambia River with special emphasis on Gulf Power. The first was done by the old Federal Water Quality Administration in October 1969. In this, the temperature profiles were evaluated at a point 1 0 0 yards below the Gulf Power discharge and again at approximately one mile downstream. The second study was done by the Florida Department of Air & Water Pollution Control in December 1969. In this study, thermal isopleths were constructed from data collected at 15 stations along the river. The third study was done by Gulf Power itself, between April and September of 1970. In this study, the temperature, dissolved oxygen, and chloride concentrations were determined for 39 days at 10 points on the river and at 4 depths at each point. Approximately 20,000 bits of data have been provided by Gulf Power and the use of a computer or personnel for an extended length of time is required to analyze the matter. The conclusions that can be drawn from these studies are briefly as follows:

The volume of flow through Gulf Power's cooling system has increased 70 percent with the addition of power generating unit number six.

There has been a rise in effluent temperature, but due to the greater volume of water being brought up to the usual effluent temperatures, the overall rise in river water temperature can be measured at a point much farther downstream.

Approximately one mile downstream from Gulf Power's discharge, the temperature rise is presently 9.0 degrees Fahrenheit above background instead of 5.8 degrees as measured prior to the installation of unit number six.

Reduction and changes in biological species below Gulf Power's point of discharge have been documented, but it cannot be determined that these effects are related to temperature. As a side observation, in the biological study of the Escambia River in the early 1950's by Dr. Ruth Patrick of the Academy of Natural Sciences of Philadelphia, she noted that the physical characteristics of the river sides and bottom and the fluctuation in the length of the salt water tongue caused by seasonal variations and rainfall prompted a continual transition from salt to freshwater biota and vice versa. This transition is as obvious today as it was in the early 1950's; therefore, it is extremely difficult to assess the degree of effect on the biota caused by temperature variations.

In response to a directive from the Department of Air & Water Pollution Control and the conference of 1970, Gulf Power has expedited the purchase and installation of a cooling tower to serve unit number six. This will not abate the discharge of heat, but will reduce the temperature rise to a pre-number six level. The company is presently "shaking down" the cooling tower. It should be in full operation in the very near future.

Gulf Power has received a permit to construct generating unit number seven. Unit number seven will have its own cooling tower which will be installed as part of the overall construction and go on-line at the same time that the generator does. Construction schedule calls for completion of this installation by February of 1973.

Recommendation number eight has to do with the domestic waste discharge by Century, Florida, and Brewton, Alabama. We can report that as of December of 1970 the discharge of raw sewage by Century, Florida, was eliminated as a result of the construction of a settling chamber, a half acre stabilization pond and appropriate chlorination facilities. These new facilities receive the flow from 52 homes, a hospital and a lumber company, an estimated flow of 20,000 gallons per day. The stabilization pond has approximately 35 days retention time. The treated effluent discharges into an unnamed creek and must flow approximately one and one-half miles before reaching Escambia River. All in all, Century has fulfilled the recommendation of the conference approximately two years ahead of the recommended date.

Additional activities relating to the Escambia Bay problem include such things as preparation for monitoring and measuring the success of the abatement programs that are presently being carried out and the investigation of summer fish kills and the activities of Escambia-Santa Rosa Planning Council.

With respect to measuring the success of the abatement programs, we are pleased to report that the Department has entered into an agreement with the University of West Florida for the development of a first order mathematical model and hopefully should lead to the determination of the assimilation capacity of the bay. It is hoped that in the near future adequate information will be available to expand this model so as to predict the assimilative capacity with respect to specific pollutants, primarily the nutrients. The University of West Florida is ahead of schedule on the development of this model. In fact, data is already being gathered for the second order expansion.

Most of the industrial companies involved in Escambia Bay are vitally interested in the future monitoring project and especially the capability to accomplish it. As a result, the Department was requested to gather information for an automated monitoring system. Proposals were obtained for five automatic samplers that would sample, analyze, and telemeter the results of ten parameters to the University of West Florida and its computer. This "cloud nine" project had a cost of approximately $350,000 to install and operate for a two-year period. The cost being excessive for the small number of parties involved to share, alternates are being explored, one of which is proving very interesting. The State University System Institute of Oceanography has acquired a 62-foot houseboat which, when equipped with adequate facilities, will be used by universities for research projects in the estuarine waters around the State. By cooperating with the Institute, through the load of equipment, we will be able to obtain data of specific interest to us that will be gathered, in addition to the specific interest of the academic students and instructors. We envision being able to monitor, on a non-routine basis, such bodies of water as Perdido Bay, Escambia Bay, Choctawhatchee Bay, etc. This cooperative program is well on the way and the industries interested in monitoring Escambia Bay will be fully appraised of its potential.

With respect to the fish kills that took place during the summer months, we were able to do a detailed investigation during the incidents of the past summer.

By way of review, 1970's mortalities began in early June and continued well into October. More than 40 separate occurrences took place in Mulat, Trout and Indian Bayous on the east side of Escambia Bay and Bass Hole Cove on the north end. Each incident resulted in anywhere from 50 to 11 million dead fish. In all cases, 99+ percent of the fish were menhaden of

1 to 4 inches in length.

Detailed chemical, physical and biological investigation substantiated previous information obtained by short-term investigations and further bore out the previous conclusions and theories as to the cause of these mortalities. In Mulat Bayou, deep holes have been dredged which act as traps for organic detritus. During the hot weather, these holes become anaerobic, thus producing hydrogen sulfide and devoiding the surrounding waters of their oxygen. The Department of Transportation has been requested to report on the filling of these deep holes.

In an effort to forestall future mass mortalities, air curtains were installed at the mouth of two of the bayous. The purpose behind these air curtains was to scare and discourage fish from crossing the screen of rising air bubbles and entering the bayous whose water quality could not sustain the livelihood of large numbers of fish. This program was highly successful in that the curtains virtually eliminated the fish kills within the bayous under control. The purpose of this program was not aimed at a solution to the problem, but to reduce the number of dead fish that were left in the water and on the banks to decay and consequently render obnoxious odors, promote fly breeding, et cetera.

Some of the more specific conclusions that were drawn from the intensive study are as follows. Extreme fluctuations of dissolved oxygen in the water occurred between mid-afternoon and dawn each day. The afternoon highs and pre-dawn lows were indicative of active algal propagations. This fact was substantiated by cell counts which revealed that in the pre-dawn hours there existed practically no algae, while in the afternoon concentrations were in the thousands. By algae, we are speaking of blue-greens and greens. Tests of water samples collected during the stress period of three major incidents revealed dissolved oxygen concentrations less than one part per million.

One plankton sample obtained during a mortality incident revealed a toxic producer "anacystis canae." The population of this species was so low that it is doubtful it played a significant part in causing the mortalities. The toxic produced was cyanide.

The final conclusion is that the fish deaths were caused by insufficient oxygen supplies. Some calculations based on experimentally determined respiration rates of menhaden and observed concentrations of menhaden occurring in some of the incidents indicate that the fish themselves can deplete the oxygen much faster than reaeration can generate a supply. The calculations reveal that 1,000 fish per square yard can deplete the oxygen in the top 6 inches of surface water from 8 to zero parts per million within 45 minutes. One count estimated a fish population in excess of 3,400 per square yard. These mennaden are virtually committing suicide in their quest for food that happens to be located in a small area with a poor water quality.

Insofar as future planning activities are concerned, as previously mentioned, the important thing to point out is that basic decisions regarding the wastewater control strategy for the area must be made. Activities are currently under way both at the State and local levels to accomplish this purpose. The Planning Division of the Department of Air & Water Pollution Control is in the process of developing basin-wide plans for pollution control and abatement which will eventually cover the entire State. As a concurrent activity, local metropolitan or regional planning councils are responsible for developing similar comprehensive plans within their areas of jurisdiction. These basin and metropolitan plans are a pre-condition to obtaining Federal funds for construction of waste collection systems and treatment facilities as a result of the new Federal requirements published in the Federal Register in July 1970.

The planning councils are now working toward these responsibilities by seeking Federal funds to assist in accomplishing the necessary related planning. Federal planning funds for this purpose are available on a 50-50 basis, and matching funds will have to be made available at the local level to accomplish the job. It is, therefore, incumbent on the local authorities to assure that the Regional Planning Council accepts its legal responsibility and that adequate planning funds are made available to accomplish the job.

Our Bureau of Enforcement report will show we are working to eliminate, or reduce to a minimum, waste discharges which have helped overfertilize the bay.

Mr. Chairman, that completes my presentation.

MR. WHITE: Thank you very much, Mr. Huffstutler.

Are there any questions or comments by the conferees?

MR. PATTON: I have a couple of comments, John.

One, I think that the Department and the staff like the idea of the TOC analysis. I think it offers hope as far as automating the analysis and this is one thing that I think we all agree needs to be done. I think that the limits of this analysis as yet have not been worked out where we can accept it, as Mr. Huffstutler indicated.

I think his comments concerning the lack of action on the shoreline, and these words were used, I believe, by Mr. Huffstutler because they were the words that were used in the previous conference report, and it translates to a bulkhead line to be established by each of the counties and then this brought to the trustees, I think that this is an important part if we are to avoid future difficulties in both Santa Rosa and Escambia Counties.

And I would like to emphasize the comments concerning planning activities under 18 CFR 601. I think that these are extremely important. We have been attempting to give the Escambia-Santa Rosa Planning Council all the support that we can and we hope that they will receive local support so that they can do the job and carry their work out properly.

MR. WHITE: Any other comments?

Mr. Reed.

MR. REED: Mr. Chairman, I just want to say to Mr. Huffstutler, a job well done. One hard year's work is in that response.

I am proud of that effort, Mr. Huffstutler, and I congratulate you and your staff.

MR. HUFFSTUTLER: Thank you, Mr. Reed.

MR. WHITE: Mr. Traina.

MR. TRAINA: Mr. Huffstutler, let me follow something that Mr. Patton brought up with regard to this carbonaceous requirement that the conference came up with. While I recognize the problems of methodology, and we have gone into some of these, especially, as you indicated earlier, in salt water, in your opinion there is no problem in removing 90 or 94 percent of carbonaceous material?

MR. HUFFSTUTLER: I don't see any, Mr. Traina, and I fully agree with the original conference report and recommendation and I think it is going to be necessary.

MR. TRAINA: You are just having a problem with methodology right now in terms of political methodology?

MR. HUFFSTUTLER: Yes.

MR. TRAINA: Not in terms of the technology of removal?

MR. HUFFSTUTLER: We are not, our Department is not. (Laughter.)

MR. TRAINA: O. K.

MR. PATTON: What we are talking about here, one of the aspects is how do you relate TOC to BOD and then eventually how do we come down to translating this as part of the rules and regulations of the State.

MR. TRAINA: I realize your legal administrative problems. I wanted to get the point across that as far as treatment, you know, we are there now, I think, in a lot of other areas in removing carbonaceous material, by that I mean BOD and TOC.

MR. REED: We are fully agreed--

MR. TRAINA: When you consider this, especially when we got the Federal report earlier indicating the high levels of carbonaceous materials, the sediments, the problems that we have all known about, this kind of thing.

MR. HUFFSTUTLER: We fully agree. We would prefer to have a TOC limit in our regulation, but right now we do not have the background and sufficient information to go to the Board and recommend a limit.

MR. TRAINA: Right.

MR. HUFFSTUTLER: We are gathering this as hastily as possible.

MR. TRAINA: Right. Kay, one--

MR. WHITE: Do you have--excuse me. Do you have any idea of the time frame on that?

MR. HUFFSTUTLER: With one piece of equipment I don't see how we could do it in less than a year. We do have on hand one piece of equipment to do TOC's. After we purchased it we were informed that they are experiencing some difficulties with determining TOC in salt water and we may have to go through a kind of an experimental program with the manufacturer to see just how far into salt water or what concentrations of salt water we can determine TOC without ruining the equipment.

But in freshwater, we will proceed as rapidly as possible to determine background for TOC and removal accuracy, et cetera, so we can recommend to our Board some TOC limits.

This has got to be done for both salt and freshwater on a different basis and I don't anticipate being in a position to go to our Board in less than a year.

MR. TRAINA: Let me just add, Kay, that we have had some experience with this in Athens. We will be more than happy to have our chemists work with you people on this methodology. We know it is a problem. We have had some experience with this.

MR. HUFFSTUTLER: We are going to call on you, quite frequently.

MR. TRAINA: Very good.

MR. WHITE: I would like to observe, too, that the conference is restricted in the orders that can be issued based on the local law and regulations of the situation, and because of this I would urge that we proceed rapidly in developing technology that is needed so we can get this important requirement under regulation and so that we can proceed to get the type of removals that are needed to preserve the bay. I think the recommendations that were set forth in the technical report represented the Federal Government's best estimate of what is needed to accomplish the job and I think we have to push forward to some removals in this order of magnitude.

MR. TRAINA: Just as a comment, it would be nice maybe if the industries would voluntarily meet a requirement like this, not have to wait on regulations.

MR. HUFFSTUTLER: I was going to say that informally, and I say informally being something less than a registered letter return receipt requested, they have been notified that we expect them to meet this recommendation even though we don't have a legal stick to hold over their heads.

MR. WHITE: I would point out that another vehicle is coming into being, Mr. Davis which the Corps touched on it briefly before, in the industrial permitting program. It is a little early yet to say what this will do in all respects, but effluent guidelines are being developed and this could very well be the area.

MR. REED: Mr. White and Mr. Traina, let me assure you that the Board, the Department and the Executive Director will give this the highest consideration on expedited programs to see if we can bring this into the State standards as quickly as humanly possible. I give you my word on that now.

MR. WHITE: Thank you, Mr. Reed.

MR. HUFFSTUTLER: Thank you.

MR. TRAINA: One other comment, Kay.

You make the statement that it is good that we might make some basic decisions now with regard to where we are going on this strategy for controlling the problems here in the bay. This relates to this question of a pipeline. I know and I appreciate the fact that you have gone into this in some detail, but if we are going to talk about future development, and I know again local people may want to comment on this later, we are going to have to at some point in time think about developing trunk line or some other thing that is going to pick up not only what we have now, which admittedly is a small amount of waste, but for the future. Will the study that you are engaging in with the University of West Florida look into this as well?

MR. HUFFSTUTLER: No. The Escambia-Santa Rosa Planning Council and our regional planning concept will look into it. And in terms of 10, 15, 20 years this has got to be looked into in great detail. But in terms of the immediate solution of the immediate problem, we think that it doesn't justify the intensive study that is required.

MR. TRAINA: I think the point is that if the local councils here in their own planning will look at this in terms of 10 or 15 years. And I think, too, that this should be tied into the work that you are engaging in with the University of West Florida in assimilative study. That is just a suggestion.

MR. HUFFSTUTLER: All right.

MR. PATTON: Mr. Traina, let me comment on your comment, if I may use that word.

Mr. Brown, who is the Director of Division of Planning, is not here and he gave certain comments which Mr. Huffstutler has incorporated in the statement he has just given. I think that the intent of the Department that has been imparted to the local planning council by our planning people is that we are interested in gathering up many of the small sources of waste, bring them to a point which translates in one sense of the word to an interceptor or interceptors. However, it may necessarily not be along the shoreline of Escambia Bay. It may be inland, it may be far cheaper to do it at this location, but I think what we are saying here is that we are moving toward the concept of regionalization, centralization and adequate treatment with proper disposal without limiting our choice of action here too severely.

MR. TRAINA: I think that is--

MR. PATTON: I think there is one other point that possibly might be good to bring out at this time. I think one of the difficulties that we are experiencing in Escambia County, and I can testify that it has been experienced in other areas of the State, is that we have too many cooks, so to speak, stirring the pot. And I think if you look back at the last session of the legislature, a bill was introduced which would have moved in this direction to create one operating agency that would have provided sewers, sewage treatment and disposal for an entire county or a multi-county area. My indications are that this will be looked at very closely in the upcoming session of the legislature and we hope that something will be coming up there to expedite it.

Believe me, we have had many long hard meetings, not behind closed doors; they were open to everybody; but it was rather difficult sometimes and rather time consuming to come down to this point in time. I think it is essential that you have to have this if you are going to get the overall job done.

MR. HUFFSTUTLER: Mr. Chairman, in preparing this presentation I have presumed, perhaps mistakenly, that the Escambia-Santa Rosa Council will probably make a statement to the conferees and I hope that they do. I am reticent to speak for them.

MR. WHITE: Of course we were hopeful also, but I don't believe they have indicated that a statement will be made at this time.

I think in all probability, and I will ask you for your advice on this, that it would appear that we will have to say that the interim plan is no construction dredging will be permitted until this shoreline plan is developed. Is this a--

MR. REED: Yes. I think also, John, this fits right in hand with Secretary Rezor's letter to the Governors of the Southern States saying that he will accept no more dredging fill permits on a piecemeal basis. That letter is on file in the Governor's office and the Trustees' office in Tallahassee.

I will again bring this to the attention of the

Governor and the cabinet. I can assure you that no piecemeal dredging fill permits will be issued by the State until a master plan for development and a bulkhead line that is acceptable to the Trustees is established. I feel very strongly about that.

MR. TRAINA: Kay, do you know if the counties plan to respond to the April 28 request?

MR. HUFFSTUTLER: No, I don't.

MR. TRAINA: It is almost a year now.

MR. HUFFSTUTLER: This is a good question and we have been reluctant to ask this question of the I.I.* folk simply because they have had an internal rearrangement in the last few months along with our political structure, and so have the counties. Evidently it will be brought out in the Perdido conference we have tomorrow.

There is interest. The interest by the special Escambia County Commission in pollution and pollution problems has accelerated quite a bit in recent months and I hope that they will stimulate the action and bring Santa Rosa County along with them and answer the I.I. Board's request for establishment of a bulkhead or shoreline.

MR. REED: We would like to point out that the Trustees do have a rule on this. If the bulkhead line has not been established in a particular bay or estuary, they will not accept an application for a dredging fill permit, so there is a stalemate there.

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* Internal Improvement Board.

MR. HUFFSTUTLER: Moratorium will exist until that shoreline is established.

MR. TRAINA: I guess if the county is happy with that situation, so be it.

MR. REED: Exactly. That is one way of avoiding the question.

MR. TRAINA: All right.

MR. WHITE: Just one other comment, Mr. Huffstutler.

I think when a municipality or a community or an industry does a good job that they should be commended. In this case it would appear that Century has acted expeditiously and beaten the deadline established by the conferees and I wish to offer a word of commendation to them.

MR. HUFFSTUTLER: We are very proud of them and we think also that the Division of Health and Rehabilitative Services deserves a lot of credit.

MR. WHITE: Thank you.

MR. CROCKETT: Mr. White, may I ask a question?

MR. WHITE: Yes, Mr. Crockett.

MR. CROCKETT: Did I understand you correctly, Mr. Huffstutler, in that you feel that there is technology for removal of TOC up to the degree specified by the conference a year ago?

MR. HUFFSTUTLER: No, I said we weren't having that problem. The industries may have the problem. (Laughter.) Our problem is with analyzing the TOC.

I honestly can't answer your question. I don't know whether technology exists, but if it doesn't it has got to be developed in the almost immediate future.

MR. PATTON: Art, I think the best answer that we can give is that this is a good concept; it still has some bugs in it. We like the concept and perhaps this might be a good place for some Federal research efforts to help move it along and answer some of these unanswered questions.

MR. TRAINA: Well, I don't want to pursue this too much, but, of course, we have participated already in some demonstration grants.

MR. PATTON: Good.

MR. TRAINA: And I think some of this was documented in the 1970 report, as I recall, and in the testimony that was given as a result of those findings and we were getting over 90 percent removal TOC in these grants. I think the technology is an improvement here and we can reissue those.

But that is the record to date.

MR. HUFFSTUTLER: Past experience has shown that the technology will not develop until the limits have been set, and we may as well go ahead and accept the limits and let the technology be developed.

MR. WHITE: Very good. I think, then, that we are all agreed that we will let the limits stand under the circumstances stated by you earlier.

If there are no other questions or comments, thank you very much, Mr. Huffstutler.

MR. HUFFSTUTLER: Thank you.

MR. PATTON: Thank you, Mr. Huffstutler.

The next presentation is by the Chief of the Bureau of Enforcement, Mr. deCastro.

J. F. DE CASTRO, CHIEF
BUREAU OF ENFORCEMENT
FLORIDA DEPARTMENT OF AIR & WATER
POLLUTION CONTROL, TALLAHASSEE, FLORIDA

MR. DE CASTRO: The following presentation is a progress report of the status of cases under enforcement in the Escambia River and Bay.

I shall first recount briefly our involvement with American Cyanamid Company prior to the 1970 Federal-interstate enforcement conference on Escambia River and Bay.

On July 18, 1969, the Florida Department of Air & Water Pollution Control cited American Cyanamid for discharging to Escambia Bay industrial waste receiving less than 90 percent treatment, in violation of State rules. An additional charge regarding cyanates was later dismissed as it was determined that the substance detected was not a cyanate as the term was used in the Florida State rules.

On October 2, 1969, American Cyanamid submitted an engineering report. Their proposed abatement program and schedule were finally approved on November 26, 1969. To this date--and I repeat to this date--American Cyanamid Company has properly complied with all milestones of their State-enforced 1969 program.

The conferees at the joint conference held January 20 and 21, 1970, recommended that American Cyanamid Company reduce discharges of carbonaceous and nitrogenous wastes in 94 percent, phosphorus wastes in 90 percent and cease discharges of acrylonitrile.

On May 8, 1970, American Cyanamid was ordered by the Department of Air & Water Pollution Control to take immediate interim measures to cease discharges of deleterious, floating and/or settleable substances while their overall major abatement program progressed. This they complied with and the corresponding Notice and Order was dismissed January 13, 1971.

The Florida Department of Air & Water Pollution Control Board Order dated August 7, 1970, confirmed approval of

American Cyanamid Company's State-enforced abatement program of October 2, 1969.

Phases I & II, Wastewater Characterization Study & Treatability Report, have been duly submitted and have been approved by the Department of Air & Water Pollution Control. Phase III, Pilot Plant Study, is currently under way and due for submittal July 31, 1971. Phase IV, Final Plans, Specifications and Construction Schedule, based on results of Phases I, II & III, is due January 1, 1972. Overall completion is December 31, 1972.

Our pre-Federal conference involvement with Escambia Chemical Corporation also dates back to July 18, 1969, when they were cited for discharging untreated industrial waste into classified State waters.

In October of 1969, Escambia Chemical submitted a report which was approved on December 15, 1969. To this date, and again I repeat to this date, Escambia Chemical Corporation has duly complied with all milestones of their State-enforced 1969 program.

The conferees also recommended that Escambia Chemical Corporation reduce discharges of carbonaceous and nitrogenous waste in 94 percent and phosphorus waste in 90 percent.

Florida Department of Air & Water Pollution Control Board Order dated August 1970 confirmed approval of Escambia

Chemical Corporation's State-enforced abatement program of October 1969.

Escambia Chemical is currently engaged in a project intended to locate, identify and control what we call a phantom stream of highly contaminated water which is seeping into their retention pond. They are also engaged in a demonstration irrigation project intended to determine the feasibility of applying heavily loaded waste the year-round for fertilizing pasture and crops.

Pursuant to Order dated November 16, 1970, Escambia Chemical will implement one or more of the five alternate State-approved abatement sub-projects or else a new alternate substitute project prior approval by the Department of Air & Water Pollution Control, all as required to bring them to compliance with State-enforced discharge levels.

Final phase of Escambia Chemical's abatement program, consisting of plans, specifications, and construction schedule, is due October 31, 1971. Completion again is December 31, 1972.

Monsanto Chemical Company was cited by the Department of Air & Water Pollution Control on November 21, 1969, for discharging to Escambia River nitrates and substances harmful to aquatic life.

The conferees on January 20 and 21 of 1970 recommended that Monsanto reduce the discharges of carbonaceous and nitrogenous waste in 94 percent and phosphrous waste in 90 percent.

The Florida Department of Air & Water Pollution Control Board Order dated August 12, 1970, confirmed approval of Monsanto's State-enforced abatement project and ordered by December 31, 1971, the reduction of BOD discharges to values within the range of 5,000 to 6,000 pounds per day and nitrogen to about 1,500 pounds a day.

On January 25, 1971, Monsanto was ordered by the Department to submit plans and schedule of specific corrective action to eliminate and prevent effluent containing polychlorinated biphenyls (PCB) from entering waters of the State.

Monsanto's proposed interim emergency project to minimize the PCB possibility was approved and ordered by the Board on February 11th. Also ordered was the submittal to all pertinent authorities of an appropriate application for permits to cover a permanent installation to completely eliminate the PCB possibility. Technical data on the application for a permit will satisfy Board Order to report dated January 25, 1971.

To this date, Monsanto has also properly complied with all milestones of their State-enforced abatement programs.

Incidentally, implementation upon the part of American Cyanamid, Escambia and Monsanto Chemical of their State-enforced abatement projects pursuant to their respective 1969 citations will not only bring them to compliance with Florida State rules, but will also result in the reduction of their individual nutrient discharges to levels recommended after the Federal interstate enforcement conference that followed.

But all that we have said so far about Cyanamid, Escambia and Monsanto regarding their compliance with the milestones of their respective enforced programs would be meaningless without results obtained.

We are professionals in the art of abating pollution and abhor the idea of justifying enforcement with other than physical abatement. We are after results, not wordy subterfuges or alibis.

Although the targets for completion of the enforced abatement projects for the three industries are many months ahead, we have begun to see results, as the chart indicates.

This chart correlates years elapsed with combined nitrogen discharges from the three industries expressed in population equivalent factors. At this point we wish to stress, wish to emphasize, that some of the data reflected in the chart requires--

MR. REED: Joe, let me see it. I know everybody in the audience will get a good look. I want to have a look at it.

MR. BECK: Turn it around so they can see it.

MR. DE CASTRO: We wish to stress that some of the data reflected in the chart requires further clarification by our regional laboratory.

The highest point in the chart represents the combined discharges of the three industries expressed in population equivalent, that is the top one, and shown in the 1970 Federal report.

The top line represents the downward path of the combined discharges including the contribution from the so-called phantom stream currently under exhaustive investigation.

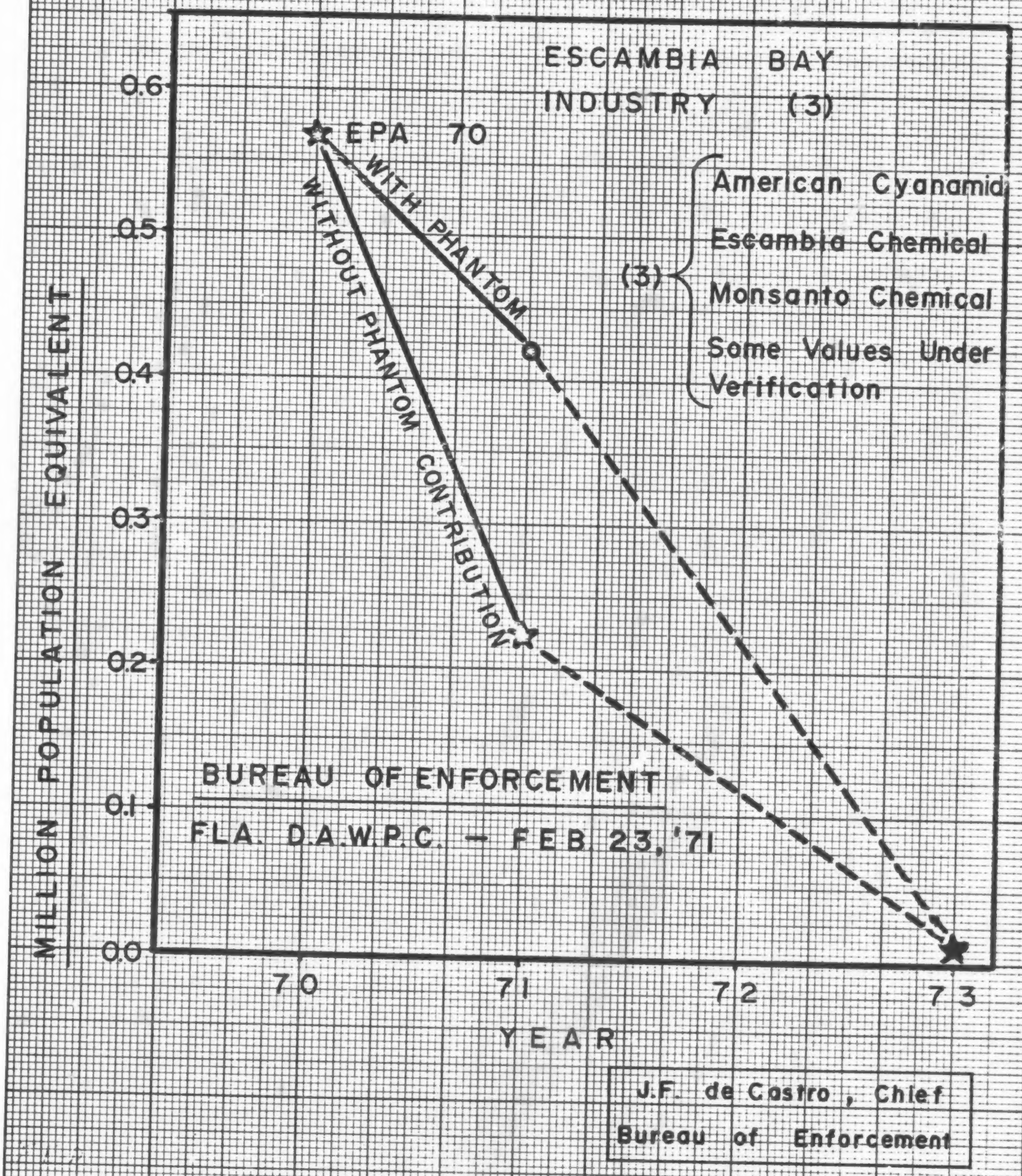
The bottom line shows a steeper downward path when the phantom stream, a nonprocess high contribution of as yet undetermined origin, is excluded from the picture.

Please note that the reduction in pollution from the combined discharges, including phantom contributions, represents 25 percent abatement. This is this point here (indicating). Excluding the phantom stream, the combined abatement approaches the 61 percent mark, from up there to here (indicating), 71.

The Bureau of Enforcement assures this audience that the enforced target, as shown in the chart, will be met--and met ahead of time.

MR. WHITE: If I may interrupt, and just to keep the record straight with Mrs. Rankin, we do have a copy of the chart that was held up and this will be entered into the record for clarification.

(The chart referred follows:)


ESCAMBIA BAY
INDUSTRY (3)
EPA 70
WITH PHANTOM
WITHOUT PHANTOM CONTRIBUTION
(3)
American Cyanamid
Escambia Chemical
Monsanto Chemical
Some Values Under Verification
MILLION POPULATION EQUIVALENT
0.6
0.5
0.4
0.3
0.2
0.1
0.0
70
71
72
73
YEAR
BUREAU OF ENFORCEMENT
FLA. D.A.W.P.C. – FEB. 23, '71
J.F. de Castro, Chief
Bureau of Enforcement

MR. DE CASTRO: Gulf Power Company was cited by the Department on January 29, 1971, for discharging floating debris, fly ash, microscopic glass, et cetera, attributable to industrial waste in amount sufficient to be unsightly or deleterious and produced a white mass and other conditions as to create a nuisance.

Gulf Power proposed temporary measures to trap floating ash has been approved by the Department and implemented by them.

An engineering report on Gulf Power's project and schedule to completely eliminate the possibility of a recurrence is due March 3, 1971.

Temperature matters were covered in Kay Huffstutler's presentation.

Now, not a part of the Federal report, but a case of enforcement of the Escambia Bay, the city of Pensacola.

The main sewage treatment plant was cited by the Department on October 5, 1970, for discharging raw sewage from the Burgess Street Lift Station into Bayou Texar and Carpenter Creek on September 23 and 24, 1970.

On October 20, 1970, an additional citation was issued the city of Pensacola Main Street Sewage Treatment Plant for discharging raw sewage from the Carrolwood Subdivision Lift Station into Thompson Bayou on October 12, 1970. Ordered was the submittal to the Department (Copy to the Bureau of Sanitary Engineering) within three days of an emergency plan of action to prevent all future discharges of raw sewage into any of the waters of the State.

On December 7, 1970, our Executive Director, Mr. Vincent D. Patton, requested our staff to prepare a case against the city of Pensacola for failing to submit an appropriate emergency plan pursuant to orders contained in the October 20, 1970, citation. The case was forwarded to the Attorney General's Office for action in December 1970.

On January 6, 1971, the city of Pensacola was issued orders for corrective action requesting it to submit detailed and specific technical data on the overall system.

On January 20, 1971, a conference was held at Tallahassee with a technical representative from the city of Pensacola and members of the Bureau of Enforcement. Matters discussed were related to the January 6, 1971, order.

On February 9, 1971, the city submitted copious technical data on the Main Street Sewage Treatment Plant. This together with the data submitted on November 23, 1970, are under perusal by our enforcement technical staff. No conclusion has been reached as yet.

MR. PATTON: Thank you, Mr. deCastro.

I note that you mentioned in there that one case against the American Cyanamid had been dismissed. Just for the purpose of clarification, I want to state that this was a case concerning solids and did not relate to the overall case, the main case, if you may have put it in that light.

I note that you did not comment on the acrylonitrile as to what had happened as far as the prevention of any further discharges of this material.

MR. DE CASTRO: The latest report we have, sir, is that the acrylonitrile is in the minute traces or nondetectable levels. That has been taken care of, practically taken care of.

MR. WHITE: Are there any other comments or questions? Mr. Traina.

MR. TRAINA: On the question of acrylonitrile, is this data that the company has given you on them?

MR. DE CASTRO: That was data I obtained through the regional engineer. I don't exactly know the source of the data. That was his report.

MR. TRAINA: Maybe this is not a question I should direct at you, but I notice that Monsanto, at least at the moment, is not listed here to speak. But could you tell us, if you will, what their plans are, this emergency plan to control PCB's?

MR. DE CASTRO: Yes. It was the feeling of the Department that most of the discharges of traces of PCB could be coming from a portion of that outfall channel, the portion of on-land channel, because the rest of the channel is lined with cement, and it was felt that first by reducing the flow velocity, not the volume, the flow velocity that would prevent or reduce or minimize the act of erosion of the mud, the possible residues and the mud. That they are doing now. They are building a dam more or less to reduce the flow, reduce the flow velocity, and then the next step is to completely condemn that portion of a line in the channel about six or seven hundred feet, condemn it and cover it with an inert filling or filler and build a new channel and a newer flow at a different point, in other words completely eliminating that area which could be contaminated with PCB.

MR. PATTON: I might add, Paul, that they can't complete the last portion of that too expeditiously because they have to get a permit from the State and they will also have to get a permit from the Corps of Engineers.

MR. DE CASTRO: That is on the way now.

MR. PATTON: Right.

MR. TRAINA: But this first phase, in other words--

MR. DE CASTRO: The first phase will be completed within the next, I would say, three or four days.

MR. TRAINA: Within that time, then, PCB's will no longer be discharged to the bay, at least from this source?

MR. DE CASTRO: Hoepfully. That is our estimated target.

MR. WHITE: Any other comments?

I would like to discuss a couple of items with you, Mr. deCastro.

First I note that we don't have an indication that the city of Pensacola is going to make a report on its Northeast Treatment Plant, at least nothing has been handed to me, and I don't see the status of their pilot study that was to have been completed by this time. I wonder if you can comment on this?

MR. DE CASTRO: I don't have the case on the enforcement. However, Kay Huffstutler was--

MR. PATTON: If we may, let's ask Mr. Huffstutler to return to the podium and comment on the status of this case. I believe he is more familiar with it than Mr. deCastro.

MR. WHITE: If you will stay there, too, Mr. deCastro, we will appreciate it. I have a few other comments.

MR. HUFFSTUTLER: The pilot study has been completed. The removal of phosphates is highly successful. They were using aluminum salts at specific locations throughout the plant.

They have run into some difficulty about lowering the pH of the sewage and this brings a question as to the treatability in the digester, et cetera. But the overall removal of the phosphates is evidently highly successful. Now they have got to make up their mind whether they are going this way or whether they are going to eliminate the northeast plant or use it as a substation or just what they are going to do.

I think a permit has been issued for them to proceed with construction, has it not, Phil?

MR. DOHERTY: No.

MR. PATTON: It has not been issued yet.

MR. HUFFSTUTLER: It has not?

MR. WHITE: Is there any chance that we could receive a schedule of their proposed actions, interim dates to comply with the recommendations?

MR. HUFFSTUTLER: Yes, sir, we can provide you with these.

MR. WHITE: You will submit that for the record, then?

MR. HUFFSTUTLER: All right.

MR. WHITE: Thank you.

Yes, Mr.deCastro, I assume that American Cyanamid is going to give a detailed report on the progress to date of their--

MR. DE CASTRO: They are going to make their presentation, and so are Escambia and Monsanto, as far as I know.

MR. WHITE: Well, we have no indication that a representative of Monsanto is going to make a statement.

I need to be refreshed. Possibly I should have already figured it out from this material, but this loading that you talk about, five to six thousand pounds per day of BOD that will be discharged by Monsanto, would you clarify for me what this is?

MR. DE CASTRO: They were ordered to reduce their discharges by December 31 of 1971, of this year--

MR. WHITE: Yes.

MR. DE CASTRO: --to a range of 5,000 pounds per day. The data we have, that has been confirmed by our regional lab, is that they are now down below that level, they are down to about 2,500 to 3,000. As I said, we want to further verify those values.

And in the case of nitrogen, they were ordered to reduce the discharge to 1,500 pounds per day. The data we have available shows that they are now down below, they are in the range of about 1,000.

We also want to verify those values. We are talking large volumes and our lab has only taken spot grab samples. The regional lab has planned a full scale 24-hour sampling on both parameters.

But the data we have is that they are below those values now.

MR. WHITE: Would it be possible for you to submit this information for the record also or an updated status report, say, within 15 days?

MR. DE CASTRO: I will have to check with the regional engineer.

What is your estimation of the completion of the sampling of Monsanto?

MR. DOHERTY: Oh, probably about two weeks, I imagine.

MR. DE CASTRO: Two weeks. The data that we have available shows that they are below those levels now, subject to verification.

MR. WHITE: Well, the conferees were charged with establishing some load limits. I don't think we have ever really come to grips with this problem and I think we will probably have to in our executive session. This is the reason that I am going into this particular area at this time.

Are there any other questions or comments?

MR. TRAINA: I would just like to make one comment. I think that chart you presented is rather dramatic proof that we can reduce these things and I was very impressed with that chart. It is good to see that we are really moving ahead, it really is.

MR. DE CASTRO: We are proud of it.

Thank you.

MR. WHITE: Thank you, Mr. deCastro.

MR. REED: Well done, Mr. deCastro.

Mr. Wayne Tisdale, Regional Engineer, Florida Division of Health.

WAYNE E. TISDALE, REGIONAL ENGINEER
DIVISION OF HEALTH, DEPARTMENT OF
HEALTH AND REHABILITATIVE SERVICES
JACKSONVILLE, FLORIDA

MR. TISDALE: Mr. Chairman, conferees.

I am W. E. Tisdale, Regional Engineer for the Division of Health, Florida Department of Health and Rehabilitative Services. You see, we all change names now and then.

My comments will concern primarily the operation and the condition of domestic waste treatment facilities in the study area and touch briefly on shellfish sanitation.

I feel that while shellfish sanitation did not enter into the 1970 conference as such, we do have some information, I believe, that is valuable and pertinent to the topic.

First in the matter of quality, during 1970, from March through August, we collected oyster samples from Escambia Bay. These were examined in the Gulf Coast Water Hygiene Lab at Dauphin Island, Alabama, and I am not certain who it belongs to any more, whether it is the Food and Drug Administration or EPA.

At any rate--

MR. TRAINA: It is half and half. (Laughter.)

MR. TISDALE: At any rate, the analysis of the first five of these samples failed to reveal any mercury content. Then the analysis of a sample collected on July 15 indicated a concentration of 0.11 parts per million of mercury. A follow-up sample collected on August 18 was analyzed and again the analysis failed to detect mercury.

In another situation at another location over in East Bay, an oyster sample was collected and was split between the Dauphin Island lab and Georgia Institute of Technology through the courtesy of Dr. Duke. The Dauphin Island portion was analyzed by dithizone extraction, as they usually use, with the result of less than 0.1 part per million. The portion which was directed to Georgia Tech. was analyzed by neutron activation with a result of 0.13 parts per million.

All of these results are below the concentration of 0.2 parts per million which is considered by the Food and Drug Administration as background level. These results, along with those from other agencies on the various forms of marine life and on sediments, coupled with the knowledge that oysters do concentrate heavy metals, tend to indicate that Escambia Bay is not suffering from mercury contamination.

In deference to Dr. Duke's comments, we have kept in close contact with him on the PCB levels in oysters insofar as the harvesting or the approval of areas for oyster harvesting.

In the realm of sewage treatment plants, the January 1970 conference and the FWPCA report which it included dealt rather heavily with the city of Pensacola's Northeast Sewage Treatment Plant. It was indicated at that conference that the plant was tested and as a result would be issued a citation. A thorough evaluation of the plant was conducted in February 1970, which revealed that the efficiency of the plant was within design parameters at that time. No citation has been issued.

During 1970 the flow through the plant has averaged 452,000 gallons per day while the BOD_5 removal has averaged 73 percent. The average flow is slightly over 50 percent of design capacity, while the efficiency is considerably below that which should be expected of a well-operated trickling filter plant. Generally, as the flow has increased, the efficiency has decreased.

At the present, the bypass weirs at the plant are sealed so there can be no bypass of untreated sewage. The city has had accomplished a pilot study dealing with utilization of alum for nutrient removal. This study assumed the replacement of the trickling filter plant by an activated sludge plant, and the study concluded that phosphorus can be reduced by alum coagulation, but leaves some questions concerning the maximum phosphorus removal and the solids and BOD reduction. This study does not appear to have brought the city any nearer to a decision on the disposition of this plant.

There are, without doubt, a number of factors which reduce the efficiency of the plant. But instead of dwelling upon these factors, it is the consideration of the Division of Health that the following conclusions must be drawn:

First, that the Northeast Treatment Plant, by its inherent design and as indicated by operating experience, cannot be relied upon to meet present Florida water quality standards.

Secondly, this plant is by all present concepts ill-located. Its contributions to the problems of Escambia Bay have been clearly indicated. The fact of its presence, irrespective of the degree of treatment accomplished, prohibits consideration of oyster harvesting on the west side of Escambia Bay even though commercially significant oyster beds are located there. Water recreation in that portion of the bay is also affected. The plant physically can, without question, have a general effect upon property values and aesthetics.

It is, therefore, the recommendation of the Division of Health, which I represent, that the city of Pensacola proceed with a plan to eliminate the Northeast plant and route the waste flows to other appropriate treatment locations. This is in consonance with Recommendation No. 2 of the 1970 conference.

My next comments, with all respect to Mr. Huffstutler's presentation, which I was much interested in and certainly appreciate the Pollution Control Department's recognition of the accomplishments at Century, concern at the same time some facts which must be brought out.

Recommendation No. 8 of the conference of 1970 indicated that the community of Century should install secondary waste treatment facilities, this to be done by December 31, 1972. Let it be clarified that Century is not a town in a true sense of the word. There is no charter. It is a community. But through cooperative efforts of the State and local health agencies, the cooperation of industry and local government, the Escambia County Board of County Commissioners has installed temporary treatment facilities which intercept waste flows which had for many years been discharged without treatment. Let it be clearly understood that approval of the temporary facility is limited to a 2-year period, which means that permanent secondary facilities must be installed prior to December 31, 1972.

Finally, we would like to offer a comment on Recommendation No. 2, dealing with the interceptor system for Escambia Bay with respect to "future and minor present effluents." There are definitely domestic waste discharges reaching Escambia Bay other than those specifically enumerated. Much emphasis has been placed upon the need for a single body or authority to own and operate water and sewerage utilities.

In 1970 a proposed legislative act to create a water and sewer authority for Escambia County was not successful. It is our consideration that until some such body is created or activated little success will be had with either areawide nutrient removal from wastes or with a unified waste collection and disposal system. In like manner, development will continue to be curtailed and haphazard and public health will suffer due to the inability or the unwillingness of utilities to provide needed services.

At the present time, discussions seem to be proceeding well between the Board of County Commissioners of Escambia County and the Pensacola City Council toward provision of a unified utility system. Simultaneously, the Escambia-Santa Rosa Regional Planning Council is in process of developing a 5-year sewer plan. Certainly we shall anxiously and hopefully look toward some beneficial results from these proceedings, for we feel that either through this method or through legislation these are the only two ways that this overall problem can be solved.

MR. REED: Certainly that is pertinent, Mr. Tisdale. We have just finished an enforcement conference in Dade County, 27 municipalities, one county commission, 28 fiefdoms, 28 kingdoms, repeated in Broward County with 30-some-odd municipalities in the county, Palm Beach County with 39 or 41 municipalities in the county, and somewhere along the line the people in this State are going to have to rise up and refuse to go along with this antiquated business of border lines on pollution control. This is absolutely ridiculous. It is expensive and it is not getting us anywhere.

So I concur with your last recommendation 1,000 percent. It is a good strong one. I think we ought to go further, conferees. Unless agreement is rapidly reached between the two entities in this county, I think we ought to look very seriously into the considerations that we looked into in Dade County.

MR. PATTON: Wayne, let me ask you one question. You mentioned it is your consideration that the Northeast Plant cannot be relied upon to do the job. Have you made this conclusion and recommendation known to the city fathers?

MR. TISDALE: Yes, I have discussed this in some detail with consultants to the city.

MR. REED: Who are the consultants?

MR. TISDALE: Flood and Associates.

MR. REED: From Jacksonville?

MR. TISDALE: Yes. In all due respect to Mr. Huffstutler, if I understood the charge correctly that he would give you a timetable of Pensacola, I sure would like to see it. I don't know which one he was referring to, but I haven't seen one.

MR. PATTON: I think possibly from what we have seen in the operation of their main plant that perhaps we need to incorporate all of these into one order. Perhaps we have a mechanism that we can use to help expedite this.

MR. REED: It would be foolish, it seems to me, to put an order against the Northeast one when surely, from the results of this disastrous last year, we have got to get at the Main Street Sewage Treatment Plant as well.

MR. TISDALE: I think, Mr. Reed, that the entire picture is bound up into this matter of overall plan.

MR. REED: Yes, sir.

MR. TISDALE: There is no question. Because when you discuss a situation outside the city, it ties into some other picture inside the city, and the Regional Planning Council, I think perhaps in this plan that is being developed, hopefully they would come out with a master plan that can and must be followed by all concerned. How everyone concerned can be made to follow this plan is a question, but it has to be.

MR. REED: Federal money is the way, that free money. (Laughter.)

MR. TRAINA: I might add that Federal money also implies Federal persuasiveness too. It is a two-way street.

MR. REED: We have gone through this in Broward and

Palm Beach Counties, we have struggled for two years, and finally, finally, finally when the threat was realized that the cutoff of all Federal money, HUD money and every other kind of money, was realized down there, it is amazing how fast the solutions began to come. Boy, solutions came out of the air, good solutions which obviously had been well thought out well ahead of time and had been buried at the bottom of reports in lower drawers. When the threat of the loss of Federal money came out, bingo, out came the plans that are good plans and sensible plans and that will work.

MR. TRAINA: I would just like to add, I think the city of Pensacola--and I don't know whether they are here--they have indicated no response to this, but I think they should be made aware of the fact that these conferees are very concerned about the apparent problems that they are facing, or not facing I guess is more appropriate.

MR. PATTON: Mr. Chairman, just for the record, in case--well, let's just say to prevent any misunderstanding, I would like to have it noted for the record that my office sent out a letter to approximately 14 people, inviting them to be present and make presentations at this conference reconvening, and one of those parties was the representative of the city. So I think that they have been made aware of it through this and other means.

MR. WHITE: Thank you, Mr. Patton.

And I would like to thank you, Mr. Tisdale, for an excellent presentation, and to echo what Mr. Reed said about the need for moving into this area with some consolidation where possible and feasible.

I also take note of your statement concerning Century. Possibly we were a little premature in praising them. We will investigate this problem and come out with a revised statement.

Yes, Mr. Reed.

MR. REED: Any of those who are on the list to speak this afternoon that have a difficult airplane schedule, if they will see me directly when Mr. White concludes this morning's session, I will reorganize my list of witnesses for the afternoon session.

MR. WHITE: Very good.

With that, I believe that we will stand recessed for lunch until 1:45.

(NOON RECESS)

AFTERNOON SESSION

TUESDAY, FEBRUARY 23, 1971

MR. WHITE: Let's reconvene, please.

We will continue with the Florida presentation. Mr. Reed.

MR. REED: Our next speaker is Mr. John Kramer, Technical Manager, Escambia Chemical Corporation, Pensacola.

J. D. KRAMER, TECHNICAL MANAGER
ESCAMBIA CHEMICAL CORPORATION
PENSACOLA, FLORIDA

MR. KRAMER: Mr. Chairman, conferees, ladies and gentlemen.

I am Jack Kramer, Technical Manager for Escambia Chemical Corporation, which is a wholly-owned subsidiary of Air Products and Chemicals, Inc.

A little over a year ago, Mr. T. L. Carey, President of our company, made a statement before this conference. He traced our history of concern over the environment and the steps which had already been taken to abate pollution at our local plant. During the past 13 months this concern has continued and additional positive steps have been taken that are designed to further reduce the nutrient contribution to Escambia

Bay.

You will remember that the FWQA report issued last year noted that Escambia contributes only 1 percent of both the 5-day BOD and TOC discharged in the study area. The report also noted under the heading "Toxic Wastes" that "No compound in the Escambia effluent had concentrations greater than 5 mg/liter.

I would like to discuss the more important of these steps which I mentioned above in greater detail with you:

1. Expansion of Facultative Stabilization Ponds.

Scheduled for completion in mid-March is a $400,000 expansion project for our facultative pond system. The present single, 3-acre pond will be expanded to a system of three ponds covering 35 acres, increasing our retention capacity about tenfold and providing a safety reservoir to contain any inadvertent plant upset. These expanded ponds will provide significant reductions of nitrogen and phosphrous.

Dr. James B. Lackey, a retired Professor of Sanitary Science at the University of Florida at Gainesville, has made extensive biological studies of the small pond during the last 18 months, during which time he has also studied the effect of our effluent streams on Escambia Bay. In his study on our present biological pond, Dr. Lackey found a well balanced biota to exist year round. On the basis of these findings and his recommendations, an expansion of the pond was planned, taking maximum advantage of the swampy area between our plant site and Escambia Bay. To quote from Dr. Lackey's conclusions relative to the expanded pond, he states as follows:

> "The enlarged system of three ponds will provide a longer detention period during which a heavy biological growth will occur, involving all levels. There will be a continuing uptake of nitrogen and phosphorus and incorporation into the air as normal nitrogen, into the pond sediments, and into the bodies of worms, insects, fishes and frogs."

The present pond has demonstrated its ability to support abundant fish life and we have every reason to believe that the expanded system will do even better.

Our present discharge has a minimum dissolved oxygen level of 3.5 ppm. Generally, it exceeds the levels measured in Escambia Bay by the FWQA. Also a part of the pond project are three aeration terraces--one on the discharge of each pond. We expect these to raise the dissolved oxygen level even further.

2. Closing of the NPK Production Plant.

Escambia has closed the operation of its $2,500,000 NPK granular fertilizer plant. The decision to close this fertilizer plant reduced the phosphrous and nitrogen content of the plant effluent into the bay, but unfortunately did result in a reduction of 20 employees.

Many studies had been made on the operation of this plant with respect to the environment. Considerable sums of money were also spent, which included a total recycle water system to serve the scrubber system. Further studies led to the conclusion that nutrients were still escaping and that the additional capital required to correct the problems would render continuing operation of this plant economically impossible; therefore,the decision to discontinue its operation.

3. Reduction of Quantity of Effluent to Escambia Bay.

By April 1, we will have completed a project that will reduce our effluent stream by one million gallons per day. This will be accomplished by converting from once-through well water to cooling tower water on a large exchanger in our ammonia plant. This change will, in effect, allow us to shut down one of our present freshwater wells for the purpose of water conservation.

In addition, we expect to trim another 500,000 gallons a day or 10 percent in June because of revisions in the methanol plant. This particular change will also reduce TOC or BOD from this plant, and is the result of applying water conservation and recycle techniques. These two projects alone will result in 1-1/2 mgd effluent reduction.

4. Ammonium Nitrate Plant.

Major work has been done in this plant in acid-proofbricking large areas to confine and recover spills and major revisions to the reclaim system are under way. This reclaim system is designed for recovery of ammonium nitrate lost from process upsets, spills, etc.

5. Polyvinyl Chloride (PVC) Treatment System.

Construction is under way with completion expected May 1 on a treatment system specific to the PVC plant. This system will remove 95 percent of the phosphorus discharge from this plant by magnesium hydroxide treatment. This is the last remaining source of this nutrient in any of our operating plants and when completed the phosphorus discharged to the bay will be essentially nil.

6. Miscellaneous Source-Control Projects.

We have been continually on the alert within each of our plants where weak waste streams may be collected and recycled to the process. We have done this in a number of cases and have a number of similar possibilities under consideration.

The net effect of all this is a 30 percent reduction of total nitrogen in our measured in-plant streams.

In addition, we have complied with everything that has been asked of us by the Florida Department of Air & Water Pollution Control. Supplementary data were supplied following last year's conference. A formal progress report was issued in June. This report gave very complete data on all of our effluent streams which were collected during an intensive measuring and sampling program covering a 2-week period. The same report presented a program to be followed and discussed various possible treatment alternatives. Finally, monthly letters are issued to the Department giving the data which they had requested. You may be interested in the fact that we have computerized all of our effluent data, which gives us very prompt results and a continuous readout on our progress.

As Mr. deCastro mentioned in his presentation, Escambia does have an unidentified nutrient loading, and I should say also water loading, which we have been working very hard to move into the identified column. Our outfall drains about 2,600 acres of land, upon which some 10 mgd of rain falls within an average year. In 1970, 67.5 inches of total rainfall was experienced in Pensacola. At this time, we are not completely sure of how much "natural" versus "industry-created" nutrients this contains. Among the positive steps we have taken in this area are the following:

1. Within the facultative pond expansion discussed previously, we have initiated collection system improvements which will allow us to gain much better insight as to the source and characteristics of this unidentified stream.

2. We have installed and routinely analyzed some 83 cased test wells to identify underground sources of nutrients.

3. We have had a hydrological expert in from our consultants, Black, Crow & Eidsness, out of Gainesville, to help us define a program, which is now under way, to define sources of both the water and the nutrient loading.

4. Nitrogen removal from wastewater is one of the most difficult technical problems. Present technology in this area is very costly, complex, and does not really provide adequate removal. Nevertheless, we have looked at many treatment methods, including the following:

a. Anaerobic denitrification.
b. Deepwell disposal.
c. Fish raising and harvesting.
d. Activated carbon.
e. Spray irrigation, or crop raising.

On spray irrigation, we have consulted with Dr. Curtis Hutton of the University of Florida Experiment Station at Chmuckla. With his help, a program was defined and we are now pursuing the first step in this program. This will involve small test plots which will tell us how fast and how far nitrogen will move through our sandy soil, which will in turn be a measure of the practicality of such a treatment method. This phase of the study will be completed within the next month.

Because all of these methods are fraught with difficulties technically, we were very interested to hear of the development of an ion-exchange technique for nitrogen removal. We learned of this only last week. Research has been done on this technique and the research was partially funded by an FWQA grant. We immediately sent two of our technical people to examine this work for applicability to our own program. They returned last Friday night. Obviously, there has not been time to do much in the way of evaluation and it is therefore too early to be more specific on the utility of this approach.

We submit that Escambia has been, and will continue to be, a leader in pollution abatement. If there are any further questions, I would be happy to answer them.

MR. REED: Mr. Kramer, where was the FWPCA grant on the ion, where physically was this to be done, do you remember offhand?

MR. KRAMER: The Farmers Chemical in Tyner, Tennessee.

MR. REED: Very interesting. Very good.

Tell me a little bit more about this phantom stream. I have got an awful lot of phantoms. Is this an underground stream?

MR. KRAMER: It is underground water. We have observed it for a long time surfacing in the area below the area B.

MR. REED: I see.

MR. KRAMER: It is completely external to the collection system that did exist. We have already completed the ditch across above that swampy area and we can see it flowing in that ditch.

MR. REED: Do you think this was a stream that historically has entered the bay?

MR. KRAMER: Yes.

MR. REED: Has the USGS been invited to do any work in this area? They are a very great use, usually, in determinations--

MR. KRAMER: We have used a lot of their work in determining the acreage that we drain and this kind of thing.

MR. REED: If this continues to be a problem, perhaps the State and the company and the USGS could form a tri-party agreement to bring them in and help assist you--

MR. KRAMER: Certainly.

MR. REED: --in trying to locate and identify the stream.

MR. KRAMER: We are pursuing this program. I can't hardly say his name, but Dr. Bengochea--

MR. REED: Oh, yes, you are in good hands.

MR. KRAMER: --has been up here.

MR. REED: Bengochea is a hard name; it took me a full conference to get it down pat. Bengochea is a top man. You are in good hands.

MR. KRAMER: We have had him.

MR. REED: Fine.

MR. WHITE: Are there any other questions or comments?

MR. TRAINA: Mr. Kramer, do you presently have available to you what the actual loadings from the plant are? You have indicated in your statement a number of places where you have reduced it and closed parts of your facilities down. Do you know what your present discharge of nitrogen is from the operation?

MR. KRAMER: From the operation itself? Yes.

MR. TRAINA: Is this in--I haven't seen your statement.

I would like to know--Mr. deCastro had shown us some very good figures on what is presently expected, but these were summary figures of all three plants--and I would like to get from you what Escambia Chemical particularly has done to date on nitrogen. Apparently it has done quite a bit.

MR. KRAMER: Well, our in-plant streams are within the range of 1,500 pounds a day of total nitrogen.

MR. WHITE: Are there any other comments?

Thank you very much, Mr. Kramer.

MR. REED: All right. Mr. Kenngott, Manager, Santa Rosa Plant, American Cyanamid.

G. J. KENNGOTT, MANAGER
SANTA ROSA PLANT
AMERICAN CYANAMID COMPANY
MILTON, FLORIDA

MR. KENNGOTT: Mr. Chairman and conferees.

I am G. J. Kenngott, Manager of American Cyanamid Company's acrylic fiber plant located in Santa Rosa County. This plant was built in 1958 and has been expanded substantially since then. Almost 700 people are employed in our plant.

At the January 1970 meeting of this conference, I presented a statement describing the environmental work that had been done prior to construction of the Santa Rosa Plant and since operation began. A supplemental statement was submitted to Mr. Murray Stein on February 5, 1970. Both are included in the proceedings of that meeting, a copy of which you have received.

Since the January 1970 meeting, the Santa Rosa Plant has made process changes which have already resulted in substantial reduction in the volume of several compounds discharged in the plant's treated wastes. We have reduced the discharge of acrylonitrile by 93 percent, total oxygen demand by 45 percent, total Kjeldahl nitrogen by 37 percent, total organic carbon by 29 percent, total solids by 29 percent, and 5-day biological oxygen demand by 18 percent.

At the January 1970 meeting I reported that Cyanamid was actively following a program to satisfy an order received from the Florida Department of Air & Water Pollution Control (Case No. IW 227-69) to comply with Chapter 17 of the Florida Statutes by January 1, 1973, or earlier. The program, which had been accepted by the State on November 7, 1969, consisted of four parts.

On April 22, 1970, we submitted to the FDAWPC our final report on the first phase of the approved program. This phase, entitled "Wastewater Characterization," included a complete survey of the physical, chemical, and biological aspects of all wastes entering the plant's present treatment facility. We also determined the nature and volume of each plant waste source, including process and area waste discharges.

On January 15, 1971, we submitted to the State agency a final report on Phase II which provided for evaluation of methods for the reduction, treatment, and disposal of our wastewater. This included a description of three physical-chemical treatment approaches to remove contaminants from selected waste streams:

The Permutit Company, Inc., Princeton, New Jersey, evaluated a progressive mode ion exchange system to remove and recover thiocyanate. This system is sufficiently promising to warrant larger studies on a pilot plant scale to establish process economics.

Resources Control, Inc., West Haven, Connecticut, evaluated electrochemical decomposition of thiocyanate. At this time the results do not appear to justify further large-scale evaluation.

Calgon, Inc., Pittsburgh, Pennsylvania, investigated precipitation-coagulation-carbon adsorption as a means of removal of suspended solids and soluble inorganic and organic compounds. It was found that this system is not conducive to high removals of total organic carbon. No further work is planned with this system.

This report also contained an evaluation of the potential of subsurface (deep well) disposal and showed that deep well disposal of about 15 percent of the total wastewater would remove about 85 percent of the total nitrogen going to our present wastewater treatment system. At this time, and as a part of Phase III, our consultant is designing an exploratory deep well to determine feasibility of subsurface disposal. He will contract for and supervise its construction, demonstrate that it meets State and Federal requirements, and prepare a report including results and estimated costs for final installation.

The Phase II report also described bench scale studies which indicated that Santa Rosa Plant wastewaters may be treated by a 3-stage biological process to:

A. Reduce Total Organic Carbon by about 80 percent.

B. Reduce Total Nitrogen by about 72 percent, and

C. Reduce Biological Oxygen Demand by more than 90 percent.

These bench scale studies also indicated a reduction of acrylonitrile below limits of detection by standard methods. The 3-stage biological process included, A) degrading carbonaceous materials to carbon dioxide, B) converting ammonia nitrogen to nitrate nitrogen, and C) converting nitrate nitrogen to nitrogen.

The biological process described is based on technology developed and reported by the Federal Water Quality Administration of the Environmental Protection Agency. We understand this process is now being tested in large-scale demonstration plants funded by Federal grants. Problems reportedly are being experienced. Therefore, we believe a high degree of technical risk may still be associated with this process.

Our Phase III program also has under way the installation of a small pilot plant to establish design criteria for plant scale biological treatment. The pilot plant operation will differ from bench scale tests, conducted in Phase II, in that, A) the feed will not contain those streams to be disposed of in a deep well, B) the feed stream will be larger, C) demonstration runs will be longer, D) it will be operated mainly under the best conditions determined in Phase II, E) a wider variety of prime variables (i.e., mixed liquor suspended solids, retention time, etc.) can be tested, and F) sufficient sludge will be produced to establish how best to dispose of it. This data is needed to design and install a plant scale unit.

After the January 1970 meeting, we had an opportunity to review more thoroughly the basis for the 94 percent nitrogen reduction recommended at that meeting. You will recall that the basis for this recommendation was a paper by H. D. Putnam (Reference #23, page 62, of that original report) describing Waccasassa Bay. It became obvious that the 94 percent nitrogen reduction was based solely on a comparison of nitrate nitrogen in Escambia Bay versus that in Waccasassa Bay. The recommendation did not include consideration of total nitrogen, which we feel is more fundamental to eutrophication.

On July 20, 1970, our consultant, Dr. Werner Stumm, then Gordon McKay Professor of Applied Chemistry at Harvard University, submitted his comments concerning this subject to Mr. T. S. Gallagher, Chief, Engineering Services, Federal Water Quality Administration, Southeast Water Laboratory. A copy of

Dr. Stumm's memo is attached and should be placed in the record of this meeting. We have had no reply to Dr. Stumm's comments.

We are aware of Executive Order 11574 dated December 23, 1970, and the proposed regulation of the Army Corps of Engineers concerning "permits for discharges or deposits into navigable waters" based on the Refuse Act of 1899. We have requested an application form from the Corps of Engineers' Mobile Office, which we expect will be available in late March. In the event an application form is not available, we will apply for a permit in letter form. I would like to advise the conferees that the Army Corps of Engineers has on file our original permit for the present outfall line which was submitted in compliance with Section 10 of the Refuse Act of 1899.

In addition to the work being done within the plant, American Cyanamid Company has further demonstrated its sincere interest in Escambia Bay by contributing to the Office of Environmental Studies of the University of West Florida to help finance the continued development of a model of Escambia Bay. We recommend continued State and Federal support for the studies already under way.

In conclusion, I assure you that Cyanamid will continue to give top priority to installation of pollution control facilities and to completion of our overall wastewater treatment and disposal program.

I thank you.

MR. REED: Thank you, Mr. Kenngott. I am still in the middle of the memorandum. It is going to take me quite a while to read that.

MR. WHITE: Well, with respect to the memorandum, I would like for the record to show that it will be entered in as part of the official transcript.

(The memorandum referred to follows:)

MEMORANDUM

TO:

Federal Water Quality Administration
United States Department of the Interior
Southeast Water Laboratory

Attention: Mr. Thomas S. Gallgher
Chief, Engineering Services

and

American Cyanamid Company

Attention: Dr. Charles Priesing
Supervisor, Environmental Engineering

FROM:

Dr. Werner Stumm, Consultant
Gordon McKay Professor of Applied Chemistry
Harvard University

SUBJECT:

Nitrogen Removal from Santa Rosa Plant in the Escambia Area.

DATE:

July 20, 1970

This is a brief exposé on the problems involved in calculating desirable nitrogen removal efficiencies. As a preamble I would like to emphasize that in my opinion nitrogen compounds play a major role in enhancing productivity in Escambia River and Escambia Bay and that it is desirable that Cyanamid remove as much nitrogen from its wastes as is expedient or feasible.

In order to establish a pollutional load and a recommendable removal efficiency, it is desirable to attempt a distribution between a natural load and a "pollutional" excess load. Because of the difficulty to assess the imputs from diffuse sources, (natural sources of nutrients, soil erosion, aquatic birds, insects, falling leaves, pollen, nitrogen fixation, rain water, underground seepage, etc.) the distinction is very difficult. The best that can be done under such circumstances is (i) to try to establish a base line by comparing a water system with a similar one that is non-polluted or (ii) to assess areal loadings on the basis of figures representative of runoff from the drainage basin.

In the abatement proposal by FWQA a distinction between natural load and excess load is based on the comparison between the Escambia system and the non-polluted Waccasassa Estuary. A quantitative comparison is only possible if the two systems have similar morphologies, similar drainage basin areas and similar hydraulic (differential advection) characteristics; the latter are particularly important because they determine to what extent the receiving waters can function as nutrient traps. Despite significant differences in the two systems - for example - much larger drainage area of Escambia Bay than that of Waccasassa Estuary and different tidal characteristics - a rough comparison is still justifiable. Because of the relatively rapid limnological transformations and recycling of the various forms of nitrogen, the comparison should be based, however, on total nitrogen (NO_3^- + NO_2^- + NH_4^+, Kjeldahl-N) rather than on the concentration of nitrite-nitrate nitrogen and ammonia nitrogen only. Putnam (Paper No. 7, 3rd International Conference on Water Pollution Research) writes on the Waccasassa Estuary: "The morphometry of the estuary which includes a shallow basin (mean depth 1.1 m) allows mineralized nutrient material from the bottom sediments to recycle metabolically through the phytoplankton fairly rapidly." Hence, a significant proportion of the nitrogen - nutrient reserve available in this estuary is present in the form of Kjeldahl-nitrogen. Taking this into consideration, the mean nitrogen reserves of Waccasassa and of Escambia are, respectively, 0.49 mg/l. and ca. 1.0 mg/l. This calculation which implies a reduction by abatement in the order of only 50%, perhaps more justified than the calculation based solely on inorganic forms of nitrogen; it may be considered as a lower boundary condition.

Another approach to distinguish natural load and excess load is based on estimates of runoff in the drainage basins. The few representative data available have been reviewed by Vollenweider (OECD report 1968). The overall losses from soils that have not been over-fertilized in Central Europe are in the range of 0.5 to 1.5 g N m^{-2} $year^{-1}$. As shown by Vollenweider, there is a correlation between the "surrounding factor" (= drainage area/ area of receiving water) and the primary productivity. Because of the large drainage area of the Escambia System as opposed to that of Waccasassa Estuary, such a comparison would tend to give a much larger "natural" loading to the Escambia Bay than to that of the Waccasassa Estuary.

With regard to the feasibility of specific measures to be taken, I would like to suggest that corrective and preventive measures not solely be based on either type of calculation. In order to improve the water quality of Escambia Bay remedial measures can and should be taken with regard to loads coming from all point sources, i.e., domestic and industrial discharges. The art of nitrogen elimination has not been developed as much as that of P-elimination. ~~In large scale denitrification plants operating as much as that of P-elimination.~~ In large scale denitrification plants operating with municipal sewage, efficiencies seldom exceed 80% (Wuhrmann). Removal efficiencies should be as high as technically feasible and expedient.

MR. TRAINA: Mr. Kenngott, you have indicated a 45 percent reduction today of TKN.

MR. KENNGOTT: Yes, sir.

MR. TRAINA: What are the overall proposals by Cyanamid to reduce TKN?

MR. KENNGOTT: As I have pointed out further in the body of this report, our 3-stage biological process at the moment shows a reduction of about 72 percent. We feel, again as I have indicated in this report, that we could remove 85 percent of our nitrogen by disposing of 15 percent of our effluent to a deep well. That will leave 15 percent to be handled through a more conventional system and we feel that the more conventional system will degrade a substantial amount of the remaining 15 percent of the nitrogen.

MR. TRAINA: What are we talking about in terms of pounds per day, Mr. Kenngott? Do you have those figures?

MR. KENNGOTT: These percentages are in terms of the pounds that are in the Federal report of last year.

MR. TRAINA: I see. I see. In other words, I take it by mostly in-plant process changes you have already accomplished a 45 percent reduction in TKN?

MR. KENNGOTT: I think the number says 37 percent, sir.

MR. TRAINA: I am sorry, I am looking at TOD. Right, 37 percent. And you hope by one of these other methods, deep well disposal, to remove an additional 85 percent of the remaining or 85 percent of the additional amount that is--

MR. KENNGOTT: We expect to be able to remove 85 percent of the total--

MR. TRAINA: I see.

MR. KENNGOTT: --through a deep well and the balance through the biological treatment system or something associated with it.

MR. REED: Through one of the options that you are holding available?

MR. KENNGOTT: Yes, sir.

MR. TRAINA: I was trying to get to the point which, frankly, I am still a little confused about. You have already reduced by 37 percent with in-plant changes, so you have a reduction now?

MR. KENNGOTT: That is correct.

MR. TRAINA: Now, the 85 percent applies not to the residual of the present system but to the initial?

MR.KENNGOTT: To the initial.

MR. TRAINA: I see. So you are only going to get the difference there in your deep well disposal?

MR. KENNGOTT: That is right.

MR. WHITE: I assume also that we will be able to establish a firm timetable for finishing these other improvements?

MR. KENNGOTT: As Mr. deCastro indicated in his report, the State has given us an order last August in which specific timetables were outlined, including report of our Phase III in July of this year, the submission of our design criteria by the end of 1971, and the installation--

MR. WHITE: I recall that. Excuse me for interrupting you. But you see no problems with meeting the time schedule?

MR. KENNGOTT: We intend to meet those timetables.

MR. REED: Mr. Kenngott, let me ask one question. You are just down the line from Escambia. Have you run into any kind of stream or any springs?

MR. KENNGOTT: No, sir. All of our waste is collected in the chemical sewer and goes into some holding ponds and then discharges into the bay through, I believe, a 24-inch pipe and we have seen no evidence of a stream such as Escambia has encountered.

MR. REED: Thank you.

MR. WHITE: I would comment also on the deep well disposal. The Administration has a policy that it is not totally opposed to this type disposal of wastes, but I think that it is imperative that you exhaust all possibilities for treatment and proper disposal before resorting to this, and I assume, of course, that you are doing this through your consultant and will make this presentation to the State?

MR. KENNGOTT: Yes, sir.

MR. WHITE: Are there any other questions or comments?

MR. PATTON: Mr. Chairman, may I make a point? I believe you are aware, the State of Florida, the board of this Department, adopted a policy of on-drainage and deep well disposal in May of last year, and I think that what this says essentially is that you must proceed with caution; we are looking for treatment prior to use of a drainage well to the maximum extent of technology. So I think that the guidelines that the State of Florida has set forth are very clear in this respect. I believe that Mr. Kenngott is aware of them.

MR. WHITE: Yes. Well--

MR. REED: Bengochea working with you on that?

MR. KENNGOTT: Yes.

MR. REED: He is highly capable.

MR. KENNGOTT: We are pleased to hear that.

MR. WHITE: I understand that. I just wanted to throw this kind of caveat out so that we would have it on the record and the industries here are also cognizant of it.

MR. REED: I understand.

MR. KENNGOTT: Our wastes have been described as being the most complex in the State of Florida, and if we are to have any chance at all of meeting the requirements placed on us we probably will have to use this tactic.

MR. TRAINA: I take it you have solved the acrylonitrile problem?

MR. KENNGOTT: Yes, sir. I do want to point out, you asked me what the State was reporting on. The amount of acrylonitrile in our outfall stream is below the methods of detection of the gas-liquid chromatograph. We report 93 percent on the conservative assumption that 2 parts per million are there, but actually we cannot find it on our gas liquid chromatograph.

MR. REED: Congratulations.

MR. TRAINA: You are to be commended for that. That is really fine.

MR. WHITE: Thank you very much, Mr. Kenngott.

MR. REED: Mr. James Lipe, General Supervisor, Manufacturing and Technology, Monsanto Corporation.

JAMES E. LIPE, GENERAL SUPERVISOR
MANUFACTURING & TECHNOLOGY
MONSANTO COMPANY, PENSACOLA, FLORIDA

MR. LIPE: Mr. Chairman, conferees, ladies and gentlemen.

I am James E. Lipe, General Superintendent, Manufacturing and Technology for the Monsanto Plant, Pensacola.

We received written notice of this conference from the State of Florida on February 4th and were requested that we make a report of progress to this body. We are proud to report that we have made significant progress to remove and reduce our contaminants. In this regard, we have more than met the requirements of the State regulations. This is also ahead of the timetable recommended by the conferees last year. We would like to emphasize that the steps taken in the past year are consistent with our long-standing efforts to serve the community's interests, which includes protection of our environment.

Subsequent to the conference last year we met with the conferees of the Federal Government and the States of Alabama and Florida to further consider the recommendations made for the removal of carbon, nitrogen and phosphorus from the waste going into the river. December 31, 1972, was established as the time for meeting the objectives ultimately established. We are now today substantially ahead of the timetable and in certain cases have already achieved those reductions. From the period of July through December 1970 our discharges were lower by the following percentages from those reported in the January 1970 Federal report:

Ammonia nitrogen, 65.5 percent

Nitrate nitrogen, 66.9 percent

Total nitrogen,70.6 percent

Total Organic Carbon, 71.6 percent

Biochemical Oxygen Demand, 5-day, 73.9 percent

Total phosphorus, 96.4 percent

Another recommendation made at last year's conference was that heat being discharged by our cooling water effluent be abated by January 1, 1972. Technically I believe that is December 31, 1971. At meetings held with the conferees subsequent to the conference it was determined that our cooling water discharge was not critical to and had no effect upon the bay and that within a reasonable intermixture zone from our outfall the heat was totally dissipated in the river.

The State requirements generally provide for 90 percent removal of all organic and inorganic wastes produced prior to discharge to the Escambia River. Our removal is considerably better than that required under State regulations, and I quote:

Ammonia nitrogen, total removal is 94.2 percent

Nitrate nitrogen, 93.6 percent

Total nitrogen, 94.2 percent

Total Organic Carbon, 99.2 percent

5-day BOD, 98.8 percent

Total phosphrous, 96.7 percent

Gentelmen, these are extremely high percentage removals and are certainly not commonly achieved.

In 1969 an industrial fluid which contained polychlorinated biphenyls accidentally leaked from an item of plant equipment into our plant outfall. Upon learning of this and the possible environmental effects of PCB's, we completely stopped the use of this material in our plant and have not used it since. However, since then we have been studying the ramifications, if any, to the sediment in our outfall. The State of Florida's like concern was reflected in its notice of violation served on us on January 27, 1971. Because our engineering work was already well under way, we were in a position to immediately propose a satisfactory solution which would result in complete modifications approximately 45 days after receiving all necessary approvals.

I might suggest that the first recommendation of this notice is being completed today.

As to the studies being made by Monsanto to insure the continual application of the best waste abatement program, we are presently studying the feasibility of installing electronic monitoring equipment in the river both above and below our plant. Water quality parameters could be monitored by both the State of Florida and our plant. Such a system, in addition to the continuous monitors we currently have in our outfall, would provide a means of continually assuring that the effluent from Monsanto's plant is well within the established water quality standards.

At the same time, we continue to study and implement other pollution control possibilities as new technology is developed.

Thank you, gentlemen.

MR. REED: I am very pleased to see those reductions. You have had a busy year.

MR. LIPE: Yes, sir.

MR. TRAINA: Let me just get some points clarified that I am confused about.

The percentages you showed, first the percentages, this involves some in-plant controls that the company has effected since the last study?

MR. LIPE: Yes, Mr. Traina. These numbers, of course, as I indicated, are based on last year's report.

MR. TRAINA: Right. As you know, in the study we did last year, we found relatively high levels of these materials in cooling water and condensate water. Have these been removed from these? Is this what you are talking about here?

MR. LIPE: This is the same stream.

MR. TRAINA: It is the same stream. So, in other words, the levels we found in those two outfalls have been reduced by this amount to date?

MR. LIPE: That is correct.

MR. TRAINA: Now, the other reductions you showed here, the very high ones, 94 percent, so on, 93, do these take into account the company's disposal system? In other words, these are overall reductions--

MR. LIPE: These are based on our in-plant generation rates.

MR. TRAINA: I see. Which takes into account the disposal system?

MR. LIPE: Yes.

MR. TRAINA: I see. What plans, if any, does the company have to further reduce the materials that are in the condensate ditch and the cooling water beyond what you have already shown?

MR. LIPE: Mr. Traina, certainly we have some work under way now that we feel will substantially reduce the nitrate contribution to our plant effluent. Beyond this we are approaching the limit of our technology presently, not to say that we would not consider and will not consider technology as we develop it or as it becomes available from other sources to apply to our in-plant control effort.

MR. TRAINA: Is there anything more you can do with in-plant controls? It seems that this would be where the problem was.

MR. LIPE: To say no would be a very inaccurate statement.

MR. TRAINA: You are aware of the problem then?

MR. LIPE: Yes.

MR. TRAINA: And I take it your engineers, both in-house engineers and consulting engineers, are looking into this?

MR. LIPE: Right, this is certainly part of our concern.

MR. TRAINA: I might continue for my own edification again, on the question of PCB, you talk about a system that you put in. Is this a control system within a plant or as I understood Mr. deCastro to ask earlier is this a system just to keep it out of the river for the moment?

MR. LIPE: As I mentioned, this material has not been used within the plant since September of 1969. The remnants, I should say, or the residue of the PCB that Mr. deCastro had reference to was in the sediments of our outfall, which was and is a natural lagoon with a dirt bottom, a mud bottom, and this is the corrective action that we are taking to abandon and condemn that section of the outfall and construct a new one.

MR. TRAINA: And this is the area that is actually being filled in?

MR. LIPE: Yes.

MR. TRAINA: This is the area that is being filled in, completely sealed off?

MR. LIPE: It will be a 2-step proposal, the first step of which is being completed today to stabilize the bottom sediment to an overflow dam arrangement. As soon as the new outfall, constructed in virgin territory, is complete, the old outfall will be abandoned and filled in.

MR. TRAINA: Thank you, sir.

MR. WHITE: Possibly I have missed something. I just want to get something straight in my own mind.

This BOD loading that we are talking about that you discharge now, do you have any form of treatment for the loading coming out of the ditch or have all of the reductions been made as a result of in-house improvements?

MR. LIPE: In-house prior to discharge into the plant effluent.

MR. WHITE: In other words, there is no treatment beyond that portion of your effluent?

MR. LIPE: No, sir, it is prior to collection into the plant effluent.

MR. WHITE: I recognize that you have done considerable work in removing some of these discharges, but I don't know that in my mind, and I don't know about the other conferees, that we have ever reached a point where we can ascertain that your deep well disposal counts on treatment in this situation. This is something we can consider in our session.

And I might add, I think that this will be also clarified somewhat in the near future on that when we get this industrial permitting program under way, hopefully it will be.

MR. LIPE: Most certainly. May I add, if Mr. Patton will substantiate this, that our deep well disposal system is operated in accord with the State rules and regulations and guidelines to assure safe and correct operation of such facility.

MR. WHITE: Very good. I appreciate your statements and the company's efforts.

Thank you, Mr. Lipe.

MR. REED: Mr. E. L. Addison, Vice President, Gulf Power Company, Pensacola.

E. L. ADDISON, VICE PRESIDENT
GULF POWER COMPANY
PENSACOLA, FLORIDA

MR. ADDISON: Mr. Chairman, conferees and ladies and gentlemen.

I am E. L. Addison, Gulf Power Company.

Gulf Power Company has been operating Crist Steam Plant on the Escambia River since 1945 when the first generating unit was placed in service. The pattern of operation and of heat rejection to the river remained unchanged from 1961 to 1970. On May 31, 1970, the sixth unit on this plant was placed in commercial operation.

To the best of our knowledge, there has been no damage either to the Escambia River or to Escambia Bay as a result of these heated effluents. We recognize, however, that there is an upper limit, though undefined, beyond which we should not and do not wish to discharge into the river. In 1969, with a sixth unit under construction at Crist Plant with a rating of 320 megawatts, Gulf made a decision to install a "closed-cycle" cooling tower for the unit, even though we were unable to conclude from our studies that the additional heat rejected by this unit would be detrimental to the river. In 1969, long before the convening of the initial hearing of this conference early in 1970, these plans were presented to the Florida Air & Water Pollution Control Department and we subsequently received their concurrence. We then proceeded to expedite the construction of the cooling tower and the manufacturer's initial estimate of 24 months was reduced practically in half, and I am pleased to advise you that this facility is now in operation. As Mr. Huffstutler indicated in his presentation, we are having some debugging and it is still not at full capacity, but it is in operation. The cost of this installation is $3,938,000.

Considered concurrently with the Crist No. 6 cooling tower was a similar installation for Crist Unit No. 7, a 500-megawatt unit presently under construction. The new generating unit and its associated "closed-cycle" cooling tower will be placed in service in May 1973. The cost of the cooling tower for this unit is estimated at $2,998,000.

Dr. D. W. Pritchard, Director of the Chesapeake Bay Institute and Professor of Oceanography at Johns Hopkins University, recently made the following statement:

> "Several field studies have been undertaken to establish the biological effects of actual thermal discharges into natural water bodies. Some of these studies have been under way for over five years and include studies made both

before and after the initiation of the discharge of a heated effluent. None of these studies has demonstrated adverse effects of the heated discharge on the ecology of the heated waterway."

Gulf Power Company is very conscientious about the interactions of its generating plants with the natural environment. The company has a history of good corporate citizenship and has every expectation of maintaining this posture with the communities and environments in which it functions.

Mr. Chairman, that completes my statement.

MR. REED: Mr. Addison, I would like Dr. Pritchard to be in touch with Florida Power and Light at Turkey Point, because if he was he would know that there is a problem in South Florida, very distinct problem in South Florida, and there is substantial evidence to produce the opposite conclusion.

Furthermore, in his own backyard, Chesapeake Bay, there is a thermal nuclear powerplant that is being prepared over most stringent opposition locally by the Water Quality Commission and the Federal Government.

I don't know Dr. Pritchard, he may be a very good man, but I would say that that one paragraph was subject to some dispute, also in the Great Lakes.

Nevertheless, we appreciate your report.

MR. WHITE: Mr. Traina.

MR. TRAINA: Mr. Addison, I take it the plant will, if it hasn't already, monitor its temperature discharges to the bay?

MR. ADDISON: Yes.

MR. TRAINA: Do you have a program to do this?

MR. ADDISON: Yes, we do monitor the discharge, yes.

MR. TRAINA: Is this a continuous temperature monitor there?

MR. ADDISION: It is not continuous. It is a continual monitoring in that we take readings periodically at various locations, and also this is done with the approval and in conjunction with the Florida Department.

MR. TRAINA: The reason I mention it is that thermal pollution, as Mr. Reed has indicated, is the subject of considerable discussion these days. It would be helpful to us, and I would just make a personal request, if you could make available that temperature data. I suppose we can get it through the State of Florida, I am sure.

MR. ADDISON: You can, and if you can't, we will be glad to make it available. But they do have it. In fact, this is what Mr. Huffstutler was referring to in his presentation.

MR. TRAINA: Thank you, sir.

MR. WHITE: May I ask, do you plan to do any biological studies in the area in conjunction with this monitoring?

MR. ADDISON: We are considering that, yes, sir.

MR. TRAINA: This would be helpful if you do.

MR. WHITE: Thank you very much.

MR. PATTON: Mr. Addison, one question. What is your proposed scheduling when Units 6 and 7 are on the line? Which will be your base load units?

MR. ADDISON: Well, actually I am not sure how to answer that from a technical standpoint. They both will be base load units.

MR. PATTON: I am thinking in relation to Units 1 through 5, would you contemplate that 6 and 7 are going to be base load units and 1 and 5 will be peaking?

MR. ADDISON: I couldn't say that. If we got into a situation where this is all the capacity we needed, then I would say that that would probably be true. But actually, in the summer months particularly, we generally utilize the total amount of capacity we have available.

MR. PATTON: If the situation develops in New York City again and they hook up to TVA and they hook up to you in turn, you will probably be running all seven or all six wide open?

MR. ADDISON: Yes, that is correct.

MR. WHITE: Any other comments or questions? Thank you very much.

MR. ADDISON: Thank you, sir.

MR. REED: Mr. L. F. Currier, Engineer Structures, L&N Railroad Company, Louisville, Kentucky.

L. F. CURRIER
ENGINEER STRUCTURES
L&N RAILROAD COMPANY
LOUISVILLE, KENTUCKY

MR. CURRIER: Mr. Chairman, conferees.

I am L. F. Currier, Engineer Structures, for the Louisville and Nashville Railroad Company.

I have a very short statement to make. As was requested of the L&N Railroad Company, all the unused piles stubs that were located between the piling supporting our track on our Escambia Bay trestle have been removed and these were removed in December of 1970.

MR. REED: And speaking for the State of Florida, we are very appreciative of the prompt, speedy action which was seen on the part of the L&N Railroad, and I would like for you to communicate to the President of the company our heartfelt thanks for the prompt cooperation.

MR. CURRIER: Thank you, Mr. Reed. I will be happy to.

MR. WHITE: I would also like to add to Mr. Reed's statement and commend the L&N Railroad for its prompt action in complying with the conference recommendation.

MR. CURRIER: Thank you.

MR. WHITE: Thank you, Mr. Currier.

Are there any other comments or questions?

Thank you.

MR. REED: Dr. Robert E. Smith, Director, State University System of Florida, Institute of Oceanography, St. Petersburg.

DR. ROBERT E. SMITH, DIRECTOR
STATE UNIVERSITY SYSTEM OF FLORIDA
INSTITUTE OF OCEANOGRAPHY
ST. PETERSBURG, FLORIDA

DR. SMITH: Mr. Chairman, conferees, ladies and gentlemen.

As stated, I am Dr. Robert Smith, Director of the State University System's Institute of Oceanography, located in St. Petersburg. I have collateral duties of Coordinator of Oceanography on the Board of Regents Staff of the State University of Florida.

Dr. R. E. Smith

Even though today's conference addresses the problems that we are witnessing in Escambia Bay, I would like to speak to the problems of the State overall. I will ask you to bear with me a few minutes so I can give some background on the history of why the Institute was set up, what we are doing, what the admission is, the programs we are involved in, and in turn how this relates to Escambia Bay.

The State University System's Institute of Oceanography was established because we do have a growing university system both in number of universities and size. A task force study was conducted in 1963, and it was determined at that time there had to be some direction in the development of our overall oceanographic program. We had to have some discipline; we had to have an ultimate aim, and as far as I am concerned the ultimate aim is to work together and to address needs not only of the State but society overall, Federal needs worldwide.

But nevertheless, the mission of the State University System's Institute of Oceanography is to coordinate the State University System's program in teaching and research. Those of you who are familiar with the State University System, you know that we do have seven universities now, two additional ones proposed to be opened by 1972, but nevertheless we do not limit our involvement and coordinating task to the State universities alone, of course; we work with the private universities, Miami

Nova, FIT, University of Jacksonville, and others. Too, we worked with industries and certainly other State agencies, such as the Florida Air & Water Pollution Control Administration, and with Mr. Huffstutler's group within that, and others. The point being that we have a tremendous amount of talent within the universities. We conduct considerable teaching and research, and by so doing we have quite an involvement in environmental studies.

During the past year we have been involved in an offshore study of the loop current of the Eastern Gulf of Mexico. You may have read about it, EGMEX, Eastern Gulf. It is now an international program, part of the cooperative investigation of the Caribbean and adjacent regions. We know that there is a definite water mass coming out of the Caribbean through the Yucatan Straits, transiting northward, looping to the east and then southward, and it exits through the Florida currents. In part this is the genesis of the Gulf Stream, so it is not a static body of water out there,it is quite a dynamic system, it's ever moving. In turn, not only does it bring a new marine, let's say, population up into the Gulf, but it certainly has effect on our climate.

Case in point, and in this particular case of Escambia Bay, we have to realize this bay nor any other bay is an island unto itself, because the work that we were doing in the Eastern

Gulf of Mexico study, the loop current, we have conducted three separate cruises, the eight involving eight oceanographic vessels, the second five, the most recent in October 7, and we have a fourth in June of 1971 to have ten or more ships out there to synoptically study this phenomenon that is occurring and the associated phenomena.

The drift bottles that were released in the big bend area of Florida instead of staying there, as one might imagine them to do, up in this bend area, they did not, they went northward and westward. The ones that were thrown off of the HERNANDO CORTEZ, the Department of Natural Resources research vessel, have been picked up and identified, sent in in this case, as having been found at Cape San Blas, off the beach here at Pensacola, and Mobile, and as far west as Louisiana now. So what happens down the coastline southeast of us is going to affect Escambia Bay. What comes out of Escambia Bay and goes into the Gulf will in fact affect, as you know, Alabama and Mississippi and Louisiana.

The State University System, as mentioned this morning, is developing a program with the Florida Air & Water Pollution Control Administration involving six universities. Primarily this is why I am here with you today, by invitation, to address this, because we have the houseboat that was mentioned by Mr. Huffstutler in the Pensacola area now. In fact, this afternoon it is in Escambia Bay and all afternoon Sunday we were working in the area of the Mulat Bayou and out into Escambia Bay north of the trestle area. They have gone back up in there this afternoon and they will work the stations from noon to, let's say, 5 o'clock and then they will start up again at midnight and work until they finish their stations to compare the data in this case.

But this is not a program that was, let's say, developed or implemented to put out a brushfire. This particular program has been under planning since October of 1969, at which time we had occasion to talk and work with the people within the State universities and a strong interest was expressed by a number of faculty of six of our State universities to work in the near-shore and estuarine environments of the west coast of Florida in particular. And since this is, let's say, a difficult area to work in, in that you have to have the facility, the boat, to sense the environment properly, you have to have the adequate equipment, the data have to be verified and corrected, documented as to technique, we felt that this gave us an opportunity, and this is the mission of my particular office, by servicing the ship time and equipment needs to the universities that could not be afforded or maintained by any one, this would give the opportunity to have the bay areas, the near-shore areas of the entire west coast of Florida, sampled from south of Fort Myers north and west to Perdido Bay.

Since these bay areas and the chemistry, the biology in this case, and the physical aspects would be sensed through one common set of sensors and would be recorded, in most part, through automation, then they could be machine read, once you verified them, corrected them, they were documented, then you would have comparable data whereby we now here in Escambia Bay could compare our result with Tampa Bay, Pine Island Sound, Charlotte Harbor, any bay or any river estuary on this entire west coast. If we are going to understand, appreciate and be able to predict future happenings and to address these with respect to regulation control, sensible legislation, enforceable legislation, I think we have to have these comparative figures.

And again we are at the point now that we have been talking with a number of instrument companies during the past year to develop quite a sophisticated instrument suit, but equipment that is off the shelf, not new research and development, whereby we can sense through automation, making it available through the inventory of STORET and the National Oceanographic Data Center's NAMDE system, we will inventory all parameters collected, and in this case the initial 12 parameters to be collected, and this is retrievable for industry's needs, local planning needs,State needs of any type, but, of course, our university needs for teaching and research.

We are going to have depth, temperature, salinity, pH, ammonia, nitrite nitrate, ortho-phosphate, total inorganic phosphate, alkalinity, chlorophyll and dissolved oxygens. I am sure there are other parameters that we would like to have that individual investigators will in fact collect for their own purposes, but these are the 12 that can be collected and stored through automation, enabling the individual investigator to take biological samples, sediment samples, other observations, and this will be recorded for his future needs. As stated, they will be stored in the national repositories.

With regard to STORET, we will be working through Mr. Huffstutler's office with this. The university individual participants will be using it for their own teaching and research purposes, but again an oxygen value is an oxygen value. It is not going to change if you use it for enforcement or regulation or any type of research endeavor.

I think that we have a very strong force working for us and I predict a very healthy future. I think that we are in a position to learn a lot with our bays and estuaries and be in a better position to understand them and predict what is needed in the future.

Thank you.

MR. REED: Thank you very much, Dr. Smith. We are delighted to have you here and be updated on the great interest the university system is taking in our State.

MR. TRAINA: Dr. Smith, I am going to put you on the spot here for a moment.

DR. SMITH: Sure.

MR. TRAINA: You have had some experience now in these estuaries. What is your prognosis for what these estuaries along the Gulf Coast can take in terms of residual types of pollution? Do you think this is what we ought to be going for?

DR. SMITH: Well, I'll tell you--

MR. TRAINA: I am going to put you on the spot.

DR. SMITH: And I will accept the spot. The problem we have now, we don't have a complete understanding, and I am sure industry is going to say, they always say this, you know, "Give me another $100,000 and 5 years and I will study it."

But seriously, we have to determine what the base line values are, what were they 10 years ago, 5 years. We don't have them, really, so let's start today and quit the name-calling and looking for scapegoats. Let's record them.

Now, the permissible load, the tolerable load, what the environment can assimilate, is going to be dependent on many factors: One, temperature, because the major part, if you are looking at the living system, the biological system, of removing the nutrients and incorporating them or changing them into protoplasm, the metabolic processes, the enzymatic cycles, and what-have-you, are dependent on ambient temperatures. Since they are cold-blooded organisms, they have an optimum temperature they work best at. Above that they are less efficient; below, and if you exceed the thresholds, they are going to die.

I don't know, and--

MR. REED: I wish you would get in touch with that Doctor from the Chesapeake.

DR. SMITH: Dr. Pritchard?

MR. REED: I'm afraid you might be edified. (Laughter.)

DR. SMITH: In fact, I have an article in one of the-- there is a study. I won't read the thing, but there is a lot of study along these lines and I would like to share it with you, if I may. This is some preexisting information that might come in handy to you.

But I think that maybe this statement was taken out of context, maybe he was talking about the Connecticut River powerplant or something of this nature.

MR. REED: I am going to relax. Addison heard me. (Laughter.)

DR. SMITH: We are not proposing to resolve all of the world's problem and needs, but we are here to help.

And again I think that we have to realize that when we talk about what is happening in the bays and we are starting to talk about the fate of the additives, whether it be pollutants or--at some point it is nutritional, at some point it is a pollutant. Before we can predict the fates of these additives, we not only have to understand the flushing rates of the bays but the near-shore waters and what is going to happen as these get out into the open gulf.

MR. REED: Proceed cautiously is a good term, right?

DR. SMITH: Right.

MR. WHITE: Are there any other questions or comments?

MR. PATTON: Mr. Chairman, I have one comment. I would like to take this opportunity to thank Dr. Smith for his efforts and his endeavors. He made it sound a lot easier than it was, because he and I have had a great number of conversations in developing this concept. He was most instrumental in bringing a great number of the well qualified university people in to our offices for a meeting on the 1st and 2d of February. I think we have looked for this type of assistance and cooperation from many of the State universities in the past, and for some reason or another we have not been able to achieve this cooperation.

I don't say that we won't have problems. I am sure we will, we always do when we have more than one person involved in any project, but I think he has set a very helpful tone and I would like to express my appreciation to Dr. Smith on this.

DR. SMITH: Thank you, Mr. Patton.

MR. PATTON: Just one final comment, if I may. I would like to call the conferees attention to a publication, I believe it was funded by an FWQA grant. It talks about waste management concepts for the coastal zone, requirements for research and investigation. And I would recommend that some of the people might find it very interesting reading that have not seen a copy of this. I think it points out many of the deficiencies that Dr. Smith outlined very rapidly, but there are a lot of things that we don't know yet and we hope to find out, and I think this type of cooperative effort will help.

DR. SMITH: Thank you. And if I may have one more 30 seconds.

MR. WHITE: Sure.

DR. SMITH: We always come down to the problem of, O.K., who has the responsibility and what are you going to do, and I have heard many times, when are you going to get on with your part of the program. In our case we have this houseboat that has been referred to, working with Mr. Patton's group, they are throwing in some of the equipment, and we see this as part funding from many sources. The universities are furnishing the salaries of the faculty and the students that are initially involved. We are working with the State agencies, we are working with the Federal repositories, the data repositories for handling the data, which is quite an expensive chore, as you all know, but it is mandatory that we do this. We have already talked to several of the planning councils of Tampa Bay and other areas and we are going to be coming to the industries in some cases and asking you to assist us with your resources and its money. Our resources are warm bodies and we will put them out there.

But it is going to be a joint effort. And I will be remembering the faces. (Laughter.)

MR. WHITE: Thank you very much, Dr. Smith.

DR. SMITH: Thank you.

DR. WHITE: Please proceed.

MR. REED: A. Ray Richards, Executive Vice President, Florida Wildlife Federation, Avalon Beach.

A. RAY RICHARDS
EXECUTIVE VICE PRESIDENT
FLORIDA WILDLIFE FEDERATION
AVALON BEACH, FLORIDA

MR. RICHARDS: Ladies and gentlemen. I am glad to be before you again this year and to see that we have gotten as much accomplished in northwest Florida as has been seen from the report.

A. R. Richards

I would like to explain that I am Ray Richards, the Executive Vice President, Florida Wildlife Federation. I have worked with them a good many years. We meet every three or four months all over the State. I have a very good idea of the State, expecially northwest Florida, since I visit all of the clubs in this area every possible chance.

I am a layman. I am not a speaker. But if you will bear with me, I will try to tell you what our clubs really have come up with and the area here which I am well acquainted with myself.

A good many of our people that we have on the program today live just up the hill from where I live. The American Cyanamid, Escambia Chemical, I know them very well; we are friends. We have to talk against each other once in awhile, but unless we have communication we wouldn't be to where we are today.

As Mr. Crockett knows, we have been fighting this thing for a long time. We try to stay friends even though we don't agree on everything. And in all fairness, a lot of dirty water has run under the bridge since we first met. (Laughter.)

I would like to comment that the report on the Escambia River really has been picking up some. I would like to hear more about the 40 sediments eons ago that Mr. Crockett and I and some of the others were talking about in Alabama that drains into the river that I haven't heard any report on. That is, well, most of them are sediments that drains into it.

First I would like to recognize somebody that was sent to me out of heaven, you might say, whenever I was about ready to give up and everything else, because whenever you fight this thing with your own money and your own expense and travel and you start to write letters, well, it is hard to get around to all of that, and there was a young lady, Mrs. Diane Bradley--you can rest your eyes over there--that came and started to help me write these letters.

These plants that have these phantom streams, I am sorry that the ghost had to follow, but maybe some of their deep wells from up in the country may be following them down here. Nobody knows where these deep wells that these companies put into the ground come out, if it is such a thing as a phantom stream. But I can say from my own experience, as I reported before, some people get their exercise following golf balls around, I have got out there and used nets to catch fish with and there was grass two and three hundred feet out into that bay on up until 1958 and 1959, when it started to reseed. And there was plenty of fish. You could see 40 and 50 boats out around the trestle. Now you can't get any fish in that area. If you do,well, they don't taste very good. And if there is a ghost, it must have come in along about that time.

A. R. Richards

I would like to very sincerely ask the Board to include in their search down to the mouth of the Gulf of Mexico. If you fly over that in a plane at certain times you can see streams of water coming from the main, I won't mention any names, that goes halfway to the entrance of the gulf that is colored, and you can find out where that is coming from and what it is doing to the bay. Even though it may go into the gulf and leave us, it washes back on the beach. That is one of the best incomes this area has, the people coming to the beautiful beaches we have. And there are very few left in America today, white beaches, sand beaches like we have. So if you will, please, include the area to the entrance to the gulf, I think you will find quite a few things going on that need to be investigated.

I would like to bring up something now that has been very close to me, since I live on it and I like boats. I like to travel on it--the Mulat-Mulatto Bayou. I have worked with the pollution department, Northwest Florida University, and I have been out to the dredge when they were dredging. And I know how deep that dredge went; I was with the captain a lot of times. Fifty-two feet it would reach. Now, that depth and then the silt, it wasn't prepared. If we had had this Board at that time and had the bulkhead and the retaining walls that we had whenever they opened up the last ditch in order for us to get in and out with the boats, I don't believe we would be having the trouble we are having today, because all the silt ran on down into the other parts of the bayou and now it all has settled back into that 52-foot deep hole from that mud that they took away. I believe that was the main trouble.

Now, in 1957 we were trying to get an entrance into the bay from that bayou, because it is a unique situation. Right after 1900 railroad trestle came across and they put it so low to the water, about 3 or 3-1/2 foot at high tide, you can't get a boat out. So we went to Congress to see if something could be worked out on that, and we worked on it up until a few years ago trying to get a way to get boats out. The Corps of Engineers, I don't remember his name now, one of the, as we would say, older men citizens went with me out there on a boat, and he told me that it would be all right to go ahead and dynamite that 300 feet in order to open a little bayou up going into the bay. So for several years we had a small boat entrance. We didn't have any fish kills, we didn't have any troubles.

Now, whenever the interstate came along, well, they stopped our boat entrance up. We hate to be piled up there in the bayou and can't get out. But if it is for the interest and the ecology of the area, we will have to accept it. But there wasn't any before these deep holes were put in there and all this mud was in there. And we would like to, if there is any way, whenever they start filling this back up, leave us a little entrance in and out there.

We want to thank the railroad trestle for the magnificent job they have done. We hope that everyone else will continue and finish their job and we all work with this together. The group in this area of Florida of the--well, they used to call it pollution control, then they decided a prettier name than that was quality control, and then it comes on up, you know. We want to thank them for the wonderful work that they have done in this area. And we are so lucky in having Mr. Nat Reed to be able to stay over with us, because he is a dedicated man to environment. I can say that in all honesty.

And the conclusion. Thank you, Mr. Traina, Mr. White, for coming back and checking on us and helping us out with this. Any way that you can help us, we will deeply appreciate it.

Thank you.

MR. REED: Thank you, Ray. As Dr. Livingston and Dr. Hopkins work on this with the road department, I sure hope you will stay in touch with them, because I know that your years of experience with the Mulat-Mulatto Bayou will be of great assistance to them as they formulate a plan on how to retrieve this peculiar body of water and get it back in some standard so we can use it and stop killing all these fish. I hope you will work closely with them.

MR. RICHARDS: Thank you.

MR. WHITE: I would like to say, Mr. Richards, I, too, am intrigued by this "phantom" stream and I hope we can get additional enlightenment on this very soon.

Thank you very much.

Are there any other comments or questions?

Thank you.

MR. REED: Mr.Locke, C. E. Locke,private citizen, Pensacola.

C. E. LOCKE

PRIVATE CITIZEN

PENSACOLA, FLORIDA

MR. LOCKE: I am C. E. Locke, private citizen, not beholden to anyone except myself and my conscience.

We, the citizens of this area, greatly appreciate the attention that our problem is getting. We know you have six or seven other counties and some of them are probably even worse than ours, if such can be imagined, but this is the largest group that I have ever seen in attendance at such a meeting as this, except for the one on air quality in Panama City, which was approximately the same size of this. So we see we are making progress in interest.

We are especially gratified to see the progress that industry has made. We like their claims. Their radio commercials that we hear every hour on the hour, they sound beautiful. I hope they have as competent engineers as they have writers. (Laughter.)

It is good to see Mr. Nat Reed continuing in his multi-party capacities. (Laughter.) He is one that has escaped the purge and I think the State is much the better for it.

I can assure you that also there are other officials Statewide, and I wish we could say more interest locally. Mr. Tisdale has been a wonderful conscience for our city and has been most active in keeping the city advised of the failure of the present sewage treatment plant. I don't know whether we should sue the designers, the construction men who installed it, the operators, or the city fathers that cut the specifications to save a few dollars, but it looks to me like that somebody should be stood against the wall on that.

There have been several recent proposals made that worry us. One is the gulf cannot be used as a cesspool for the entire Southeast. I think Mr. Bob Smith brought that out very forcibly in the movement of our currents, and I know that any of you that have read anything at all about the ecology of the gulf know that the Mississippi Gulf Coast and the Alabama Gulf Coast suffer from everything that comes down the Mississippi River.

It is a dead river for 100 miles on each side. The Tiber River that comes out of Rome is dead on each side, and what do you think that is doing to the tourist industry on that great strip of Mediterranean?

It also disturbs me to hear the proposals made to run an industrial line in the deep water in the gulf or deep well disposal. Suppose we contaminated one of these phantom springs. What is going to happen? Suppose we continue, and I am sure we will, to lower our subsurface water level because of the need for more water. We may get down to where we are tapping the water that we ourselves contaminate. It may not happen in my lifetime, but I would like to see something left for the grandchildren.

Another thing that disturbs me, if the city can't operate the recently constructed Main Street Plant with its present volume, and I understand it is already overloaded with certain nutrients, and it doesn't have the full third treatment, how can they handle the effluent from four or five additional industries that they propose to bring in from Bayou Chico area? This merely passes the buck to a municipality, and you know municipalities are kind of sacred cows. Shouldn't call them cows, should I? Whoever heard of a mayor of a city being fined or put in jail for carelessness or gross negligence in sewage treatment?

In the field of sewage treatment I am informed that live fish are being raised in the effluent in the third stage tank at the University of Florida. Can any other industry or city match this? If you can't, there are some lessons out there in that place.

I am also concerned that there have been some measures brought, I don't know who on or where from, and I understand our students and our professors out there are not as free to speak or to study or to evaluate as they once were. I think the State people can look into that and find out from whence this pressure is coming, if it is. I say all I have is rumors, but it sounds pretty bad.

I think that the only valid test that we can apply is can marine life live, breathe and spawn and are they edible. Glad to see that Mr. Reed says that he eats shrimp. I would hate to see them disappear.

MR. REED: I ate some oysters at lunch, I want everybody to know. If you don't see me here tomorrow, revenge has taken place. (Laughter.) They were delicious, though.

But I think that is a pretty good test of a sewage treatment plant. I was just thinking about that.

MR. LOCKE: The University of Florida has got an example, a real live example. And the students out there tell me they have made bacterial tests and they are not afraid to drink the water. In fact, they were talking about going down and catching the fish and having a fish fry. That is phase two.

Mulat-Mulattc has got a long way to go to be cleaned up as it was when I came to this area 30 years ago. It was one of the finest fishing areas in the world and I came right along behind Mr. Richards in discovering this area, I guess. I selected it because of what? Abundance of freshwater, wonderful beach, a year-round climate, and a place to raise my children. And the first thing they want to do when they come back here is to go fishing and go swimming. I am thankful that there are some places where we can take them.

I think enforcement is the only answer after safe standards have been set. Just think about it. We are starting now to apply the teeth of the Federal Government in a law that was ignored for 70 years, since 1899. I think that tells us something. I guess we were too busy developing the country and we thought we had a limitless resource in our rivers and that what went in the stream at this level didn't bother us and we didn't care what happened to the fellow downstream.

I see where the city of Lexington, Kentucky, in a recent magazine article, is dumping 18 million gallons of untreated raw sewage on their capitol downstream in Frankfort.

And to any elective officials, if there are any present, or those who are appointed by the elected officials, I would say to you as an amateur politician, I don't know whether I can even call myself that, but as a very interested voter, don't underestimate the power of an aroused public. Witness the recent stoppage of the Florida barge canal and the Everglades Airport. Can you imagine the lobby and the money that has been spent for that? But an aroused public opinion stopped those, and I say it was national aroused public opinion, who were interested in our corner, and we can be grateful that the people of the Nation want to save Florida, want to help us save our Florida.

Don't ever underestimate the power of women, and believe me those of you who haven't found out yet, they are organized, they are interested, they are informed, and the League of Women Voters are getting better informed all the time. It is an education to go and listen to them.

Elective officials must start leading. Every campaign they say that they will lead this country out of darkness, and I submit to you that they are following right along behind public opinion. If they have any foresight at all, they will see where the votes are.

And we hear every tenth word about the cost. Well, I would say that citizens are willing to pay the price of clean water when it is properly submitted to them by our leaders. We have a sewage tax, and I haven't heard an awful lot of fault with it, but it is to pay for a past debt. But we don't have a plan for financing the addition that is already needed. We should have a percentage set aside, and I don't know what it should be, but I would be willing to pay as much as $5 a month more on my water bill. I think that is as fair an assessment as you can have, in order to have a cleaner water and to set aside a sinking fund to avoid frantic planning in the next crisis. But you know as well I do, why, they will come to the State and say, 'let's have a bond issue to pay for something that we have already spent or need and pay for it."

The technology is available. In fact, two of the biggest polluters in our county have developed good systems and are in the process of manufacturing the systems for use elsewhere, and I hope they will use them here. The past bond issue, I think, was--the State amendment to the constitution had allowed a bond issue for loaning money to sewage treatment plants. I believe it was the only bond issue that passed. That shows you where the sentiment of the voters is at this time.

Engineers are available now. If you want good engineers for environmental work, I don't know where you can get them that are any better than the ones that were laid off in the cutback in the space industry, and other government as well as recession cutbacks that have made engineers highly available. If they are not exactly the kind you want, they can certainly be retrained and help; they have the background. Maybe you don't want moon environmental men, but they can be brought back to earth.

I don't believe that the city, the county, the legislature or the senate is represented here. I saw Mr. Armour earlier, but I think he made a token appearance and is gone now. Maybe he had other business. I don't know of any other business that is more important than this. But I don't see any representatives of our elected officials, I don't see our mayor, I don't see our city councilmen, and I don't see our county commissioners. And you of the press, I would like for you to make a note of that, that they are not here. (Laughter.) I think that this is a sad commentary and explains our failure to move faster.

Again I thank you for the use of your podium and your stump. (Applause.)

MR. REED: Thank you very much. We are very appreciative to have you here this afternoon. You are as eloquent as ever.

Mr. Locke, it may interest you, I hope you come back tomorrow for the recommendations.

MR. LOCKE: I will be here every day. I have no other hobby except this one. (Laughter.)

MR. REED: I hope when we conclude our activities here that we are going to take your recommendation on the city's problems very strongly to heart tonight when we write out our recommendations.

MR. TRAINA: Be assured that the conferees are also aware of the lack of presence here. Thank you.

MR. WHITE: Thank you very much, Mr. Locke.

MR. REED: Dr. Joe Edmisten is here from the University of West Florida, Director of Office of Environmental Studies.

DR. JOE A. EDMISTEN, DIRECTOR
OFFICE OF ENVIRONMENTAL STUDIES
UNIVERSITY OF WEST FLORIDA
PENSACOLA, FLORIDA

DR. EDMISTEN: Mr. Chairman, conferees, ladies and gentlemen.

I would like to take this opportunity to report on a few of the activities of the University of West Florida and particularly the Office of Environmental Studies since the last conference January 1970.

Since the January 1970 hearings in Gulf Breeze, the University of West Florida has been involved in several projects to help slow the eutrophication of Escambia Bay. Two of these projects are described here. One major project involves the production of a math model for the safe assimilative capacity of Escambia Bay. This modeling effort has had its primary source of support from the Florida Department of Air & Water Pollution Control.

And I would like to take this opportunity to thank you now, Mr. Reed and Mr. Patton, for this report. The $18,000 grant received is just a drop in the bucket to build such a complex model, so we had supplemental monies to carry the modeling to the testing phase, and these supplemental monies have been provided by three local industries--Monsanto, Escambia Chemical, and American Cyanamid have each provided $1,000 to help us go to this testing our model for real data from the bay.

The current status of the math modeling program is summarized in this report, which I hereby submit for the record. And you have that record there.

MR. WHITE: Without objection, it will appear in the record as if read.

(The report referred to follows:)

Dr. Joe A. Edmisten U.W.F.

A Mathematical Model for the Safe Assimilative Capacity of Bays
An Interim Report

Abstract:

The design of a mathematical model has begun which will be used to study estuarine pollution problems. There is an overall plan for arriving at an optimum model; the plan takes the form of an eight phase project. Some introduction to the project and how it is related to the assigned task is discussed and some insight into the construction of a model is given below. After the introduction, the phases are elabated upon in order to put the project in perspective. Finally, the model program is given as it is at this time.

Introduction:

In order to make a meaningful beginning to the project, a consultant was hired (Dr. Bernard Patton, University of Georgia). His suggestions on how to start were most helpful and useful. He suggested that we begin by using a model which was already devised. Such a model would be the segmented, steady state estuarine model of Bunce and Hetling (1). He then suggested that we elaborate this model as well as gather data to support it all within financial constraints. We were urged to pursue a model which would (i) base the safe assimilative capacity (hereafter termed SAC) on several independent variables, (ii) derive and implement a computer program to calculate the SAC (based on segmentation) (iii) and, finally, to use linear programming techniques to optimally value each segment of the modeled estuary.

With the proposals of Dr. Patton in mind, the programming of a model similar to the one of Bunce and Hetling (1) (The Delaware Bay Model) was initiated. In order to learn as much as possible about the model (and in fact the estuarine modeling process), it was decided to completely devise a program for calculation rather than copy the Delaware Bay model program _per se_. The obvious advantage to this would be an "in house" model and model-maker. Since it was desirable to go beyond the scope of the Delaware Bay model, it was obviously necessary to completely understand each step which led to its development.

The Delaware Bay model is time invariant and one dimensional. For studying a river using monthly average figures, the model has shown its utility (2). The model was implemented for studying dissolved oxygen (D.O.). What was desired for this project was to construct a time-varying, three dimensional, multi-component model. The process of doing this may be divided into several phases:

Phase I. Reprogram the original Delaware Bay model
  i) Write a program based on the same theory as the original model (i.e. The Thomann Model (3)).

Phase II. Modify the original program to work in two dimensions.
  i) Re-run the Delaware Bay data for the two dimensional case and confirm its validity.

Phase III. Segment a bay (in particular - the Escambia Bay).
  i) Enter the parameters of this bay into the model.
  ii) Test the model by furnishing data and calculating known average D. O. values.
  iii) Test the model by furnishing data and calculating known average choride values.

Phase IV. Make the model time varying
  i) Given intra-tital data,test the performance of the model.

Phase V. Implement a hydrological model

Phase VI. Marry the Phase V model to the Phase IV model.

Phase VII. Extend the model to be multicomponent and define the SAC

Phase VIII. Using linear programming techniques and the Phase VI model, optimize the use of the bay.

Theory:

The Delaware Bay model of Bunce and Hetling (1) was based upon a steady state approach to the Thomann model (3). The model involves segmenting a body of water into segments such that the concentration vector consisting of n numbers is related to a forcing function vector also consisting of n numbers by a transformation matrix which is n x n. That is,

AC = L, where A is the transformation matrix
C is the concentration vector, and
L is the forcing function vector.

The transformation may be re-arranged into $C = A^{-1}L$, and A^{-1}, the inverse of A, is known as the unit loading matrix. The matrix, A, represents flows, diffusion and advection terms, segment dimensions, etc.

In order to see how the vector C is related to A, consider the product of C by a_{i*}, a row of the matrix A. What is represented as

$$a_{i1}c_1 + a_{i2}c_2 + a_{i3}c_3 \;.\;.\;.\;.\;.\;.\; a_{in}c_n \quad (I).$$

For simplification, if the forcing function, 1_2, were being computed, and there were five segments involved

$$1_2 = a_{21}c_1 + a_{22}c_2 + a_{23}c_3 + a_{24}c_4 + a_{25}c_5 \quad (II).$$

Obviously, a_{24} for example, relates the concentration in segment four to the desired result 1_2. The Delaware Bay model is one dimensional. The segments were numbered sequentially, hence, segment one flowed only into segment two, which flowed only into segment three, etc. In this case, segment four would not affect segment two, so only the terms $a_{i-1,j}$, a_{ij}, and $a_{i+1,j}$ for the i-th 1_j would be non-zero. The result was the tridiagonal matrix in the Delaware Bay program. In this project, since it is two dimensional, a complete matrix inversion routine was necessary.

The terms of the A involve the following:

Consider again equation (II) above. The terms a_{21}, a_{23}, a_{24}, and a_{25} describe action into and out of segment two. For flows into a segment, $a_{k-1,k} = -\left[Q_{k-1k}\,\xi_{k-1,k} + E_{k-1,k}\right]$; (for conformity the notation is the same as Bunce and Hetling (1)). For flows out of a segment, $a_{k,k+1} = \left[Q_{k,k+1}(1 - \xi_{k,k-1}) - E_{k,k+1}\right]$. For action affecting concentration within a segment, $a_{kk} = \left[\, Q_{k,k+1}\,\xi_{k,k+1} - Q_{k-1,k}(1 - \xi_{k-1,k}) + E_{k-1,k} + E_{k,k+1} + r_k v_k\right]$ for the steady state case.

The terms used are as follows:

$Q_{k-1,k}$	flow in feet $^3/$ sec into segment k from k-1
$Q_{k,k+1}$	flow out of segment k into k+1
$E_{k,k+1}$	exchange factor, where $E_{k,k+1} = \frac{k_{k,k+1}}{0.5\,(L_k + L_{k+1})} \times \left[Q_{k,k+1}\,(\xi_{k,k+1}\,C_k + (1 - \xi_{k,k+1})\,C_{k+1})\right.$

and L = length in feet

C = concentration

Q = flow

k = coefficient of diffusion

ξ = defined below

$\xi_{k,k+1} = \frac{L_k}{L_k + L_{k+1}}$ where L is length,

is the advection coefficient and is approximated by the ratio of relative segment lengths.

r_k	reaeration coefficient
V	volume

For the O_2 case, the first step is the definition of A. Then, by knowing BOD loads, i.e., L, $C = A^{-1}L$ gives the BOD load for each segment. The BOD loads thence computed become the forcing functions for $L = A^{-1}L$, where C is now the oxygen difficiency due to a BOD load and L is the BOD load for each segment. The process of computing O_2 deficiencies for each segment is a two step procedure. In the a_{kk} term, benthal loads, deoxygenation, photosynthesis, and respiration may also be included if known.

It is perhaps obvious that the original unit loading matrix involves some trial and error. The terms are included and tried and corrected if necessary. It is also perhaps obvious that a good hydrological model is necessary to describe flows on intra-tidal cycles since this will be part of the time varying model.

Discussion:

The implementation of Phase I of the project entailed the gathering of reference materials and the writing of a program. The program was written and was similar to the original Delaware Bay program. There were several exchanges between the grantees and the authors of the original model, but eventually their results were reproduced with their data. Some problem with floating point underflow was encounted, but no significant error was detected. The completion of Phase I was realized.

To modify the program of Phase I to that of Phase II entailed two major modifications. Firstly, the input data had to be generalized so that there could be an interchange between non-sequential segments. This would allow two (or even three) dimensional studies. Also, a matrix inversion routine for any matrix was necessary. The original Delaware Bay model was one dimensional and hence, the unit loading matrix was the inverse of a tridiagonal matrix. Since the model of this project could have several segments interacting with one another, a complete matrix inversion routine was needed. The IBM supplied subroutine MINV was used (4). The original input data was reorganized and the output was again reproduced. Due to algorithmic differences in inversion routines, some slight difference was noted; the difference was insignificant. Also, it should be noted that the advection term was constrained to be between 1.0 and 0.5 as originally suggested by Thomann (3). This slightly altered the output, but insignificantly. With good agreement between the original report and the Phase II program, Phase II was completed.

The implementation of Phase III has also begun. Since Escambia Bay was deemed the test case, it was segmented. This was done in accord with known parameters and with the thought that the segments chosen would be as consistant as possible. The process of implementing the project at Phase III is now at the point where the parameters of the bay are needed. There is some data available (5), hence the choice of Escambia Bay for the study. During the second half of the project, this data will be incorporated into the model and tested. Average D.O. values will be sought. If time permits, average chloride values will also be studied.

The progress of Phase III will determine whether or not Phase IV can be begun. It may be that Phase IV and V will be combined into one phase and hence making Phase VI superfluous. The obtaining of good data in a tidal cycle is not an easy task. It would be advantageous if the hydrological factors could be computed accurately rather than measured tediously. This approach to modeling has not been explored in this project, but it has been done (6).

The transition from the Phase VI resulting model to the one in Phase VII will involve some innovative study. Not only must the model predict all values of would-be pollutants (i.e., BOD loads, oxygen, nitrate levels, choloride, degradeable and non-degradeable organic compounds, temperature, trace metals, etc.), but also these contaminants must be weighed in order to give an SAC index. Perhaps some of those mentioned above will not be important at all and hence some system simplification will be achieved.

Phase VIII of the project will depend on the success of whatever model is developed. It will involve some evaluations and serious thought by all concerned parties, because each segment will have to be assigned a dollar value. It may be that Phase VIII will even be divorced from the project.

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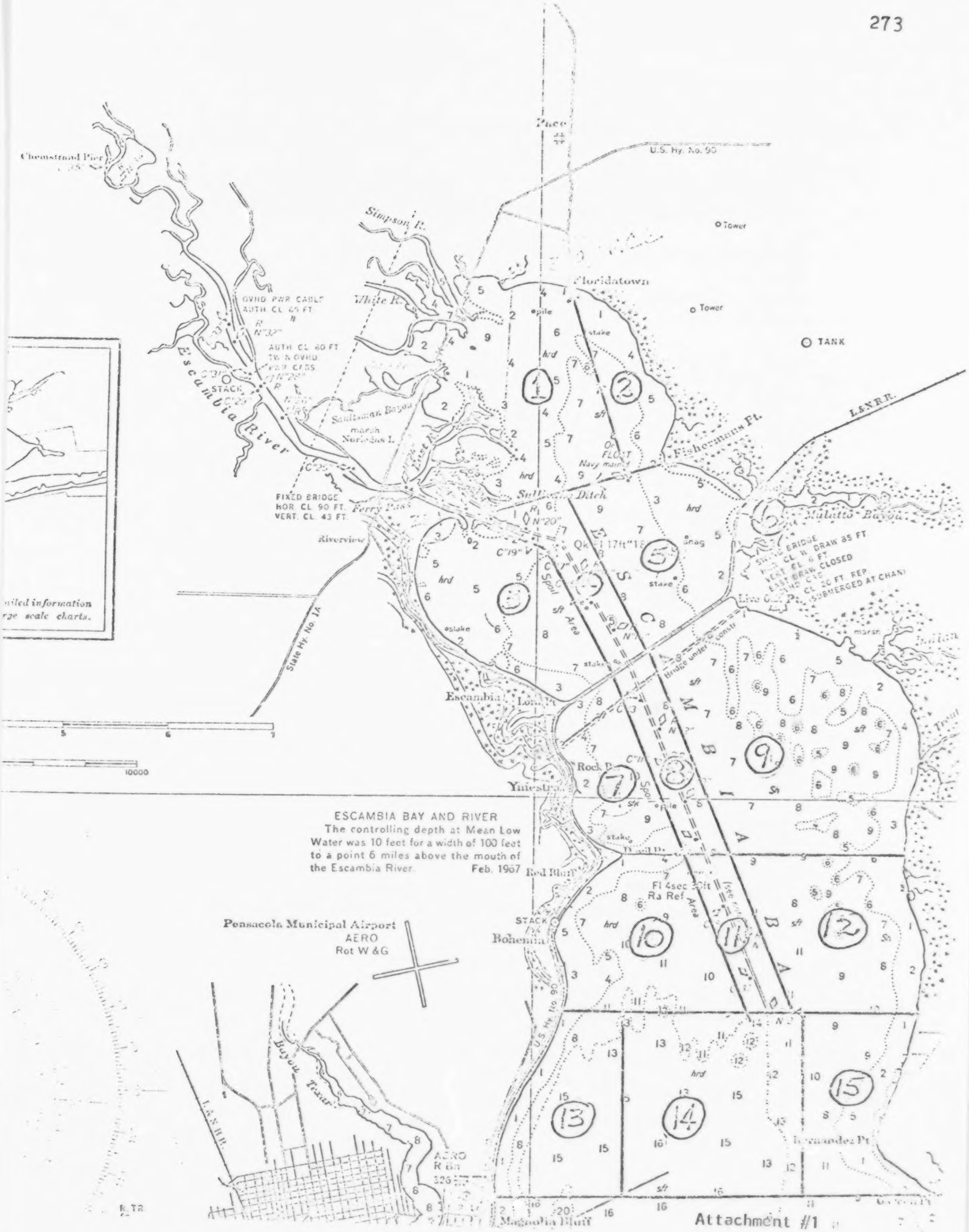
Chemstrand Pier
Pace
U.S. Hy. No. 90
Simpson R.
White R.
Tower
Floridatown
Tower
TANK
OVHD PWR CABLE AUTH CL 65 FT
AUTH CL 60 FT TWIN OVHD PWR CABS
STACK
Escambia River
Saultsman Bayou
marsh
Norlegas I.
Fishermans Pt.
L&N R.R.
Or FLOAT
Navy maint
Sullivan Ditch
Mulatto Bayou
FIXED BRIDGE HOR. CL. 90 FT. VERT. CL. 43 FT.
Ferry Pass
Riverview
State Hy. No 1A
Qk Fl 17ft "18"
SWING BRIDGE HOR CL W DRAW 85 FT VERT CL 6 FT EAST DRAW CLOSED
Live Oak Pt.
Spoil Area
Bridge under constr
ESCAMBIA BAY
Indian
Escambia
Lora Pt
Rock Pt
Ynestra
Red Bluff
Fl 4sec 30ft Ra Ref
STACK
Bohemia
Pensacola Municipal Airport
AERO
Rot W & G
U.S. Hy. No. 90
Bayou Texar
L&N RR
AERO R Bn 326
Magnolia Bluff
Hernandez Pt
1
2
3
4
5
6
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…ailed information
…rge scale charts.
10000

ESCAMBIA BAY AND RIVER
The controlling depth at Mean Low Water was 10 feet for a width of 100 feet to a point 6 miles above the mouth of the Escambia River. Feb. 1967

Attachment #1

```
      REAL MTV(40)
      DIMENSIONXKX(40),TEMP(40),CS(40),DEPTH(40),XLOA(40)
      DIMENSION DIAG(40),      P(40),               BOD(40),V(40),SINK(40)
     1)
      DIMENSION RC(40),AREA(40),        Q(40),D(40),ALPHA(10),AM(1600)
      DIMENSION DIAGA(40),XLOAD(40),BM(40,40),CN(40,40),SUMBOD(40),CONC(40)
     140)
      DIMENSION XLEN1(40),XLEN1(40),XLEN2(40),KA(40)
       REWIND 4
      READ(1,1,END=100) NUM,ALPHA
    1 FORMAT(I3,10A4)
      JX = 0
      DECAY = 0.15
C  XKX IS COEFF OF DIFFUSION FOR SYSTEM
C  ACCORDING TO FICK'S LAW
      DO 30 J=1,1600
   30 AM(J) = 0.
      FIX = 5280.*5280.
C  THE E VALUE ARE MULTIPLIED BY FT**2/MI**2  TO GIVE CU.FT./DAY
      NUM2 = NUM + 1
      IF(NUM - 0) 40,40,41
   41 IF(NUM - 40) 42,40,40
   40 WRITE(3,7) NUM
    7 FORMAT(' IMPROPER NUMBER OF SEGMENTS  NUM =',I4///)
      GO TO 100
C  XLEN IN FT.
C    V  IS IN FT**3
C  AREA IN FT **2
C   MTV IS TIDAL VELOCITY IN FT/HR  CA. 4000
C  TEMP IS IN DEGREES CENTIGRADE
   42 WRITE(3,4) NUM,ALPHA
    4 FORMAT('1  NUMBER OF SEGMENTS THIS RUN ',I3,5X,10A4///)
      DO 10 J=1,NUM
   10 READ(1,2) V(J),MTV(J),BOD(J),SINK(J),TEMP(J),DEPTH(J),RC(J),XKX(J
     1)
    2 FORMAT(E6.0,10F6.0)
      DO 61 J=1,NUM
      DIAG(J) = 0.
C  THIS IS FOR STMT 515
      CS(J) = 14.652 - 0.410222*TEMP(J) + 0.0079910*TEMP(J)*TEMP(J)
     1 - 0.00007777*TEMP(J)*TEMP(J)*TEMP(J)
      CS(J) = 7.77
      IF(RC(1) - 0.) 61,60,61
   60 RC(J) = SQRT(8.1E-5*MTV(J))
      DEPTH(J) = SQRT(DEPTH(J)*DEPTH(J)*DEPTH(J))
      RC(J) = RC(J)/DEPTH(J)
C  NOTE  RC , THE REARIATION COEFFICIENT IS FOR 20 DEGREES CENT. AND
C  SHOULD BE IMPROVED UPON BEFORE COMPLETION OF THE STUDY
   61 CONTINUE
      DO 11LA=1,NUM
      XIIN = 1.0
      EIN = 0.
      READ(1,600) NSEG,NOIN,NOOUT
      L = NSEG
  600 FORMAT(3I2)
C  KA IS FLOW TO OR FROM THE SEGMENT DEFINED BY NSEG
C  E    LENGTHS ARE BETWEEN---USED TO CALC XI VALUES
      NTOT = NOIN + NOOUT
      READ(1,601)(KA(JA),Q(JA),AREA(JA),XLEN1(JA),XLEN2(JA),JA=1,NTOT)
  601 FORMAT(2(I2,4F6.0))
      DO 602 J=1,NTOT
      Q(J) = Q(J)*86400.
      M= NUM*(KA(J) - 1) + NSEG
      IF( J - NOIN) 603,603,606
  603 IF(KA(J) - 0) 604,605,604
  604 K= KA(J)
      EIN = (XKX(K)*AREA(J)*2.0)/(XLEN1(J) + XLEN2(J))
      EIN = EIN * FIX
      XIIN = XLEN2(J)/(XLEN1(J) + XLEN2(J))
      TEST = 1.01 - EIN/Q(J)
      IF(TEST - XIIN) 612,612,613
  613 XIIN = TEST
  612 IF(XIIN - 0.5) 622,623,623
  622 XIIN = 0.5
  623 AM(M) = -(Q(J)*XIIN + EIN)
  605 DIAG(L) = DIAG(L) + EIN - (Q(J)*(1.0 - XIIN))
      GO TO 602
  606 EOUT = (XKX(L)*AREA(J)*2.0)/(XLEN1(J)+XLEN2(J))
      EOUT = EOUT * FIX
      XIOUT = XLEN1(J)/XLEN1(J) + XLEN2(J))
      TEST = 1.01 - EOUT/Q(J)
      IF(TEST - XIOUT) 610,610,611
  611 XIOUT = TEST
  610 IF(XIOUT - 0.5) 624,625,625
  624 XIOUT = 0.5
C
C  XI VALUES ARE CONSTRAINED TO BE BETWEEN 1.00 AND
C  EITHER 1 - E/Q OR 0.5, WHICHEVER IS HIGHER
C
  625 IF(KA(J) - NUM) 608,608,607
  608 AM(M) = Q(J)*(1.0 - XIOUT) - EOUT
  607 DIAG(L) = DIAG(L) + Q(J)*XIOUT + EOUT
  602 CONTINUE
      DIAGA(L) = DIAG(L) + DECAY*V(L)
      DIAG(L) = DIAG(L) + RC(L)*V(L)
      WRITE(3,28) L,XIIN,XIOUT,EIN,EOUT
   28 FORMAT(' SEGMENT ',I3,2X,'XIIN =',E15.5,7X,'XIOUT =',E15.5,9X,' EI
     XN =',E15.5,7X,'EOUT ='E15.5)
   11 CONTINUE
      NOX = NUM*NUM
      REWIND 5
  130 JX = JX + 1
      IF(JX - 2)135,35,36
  135 WRITE(5) (AM(J),J=1,NOX)
C   SAVE AM ARRAY SO CAN INVERT MATRIX
    END FILE 5
    GO TO 235
 35 REWIND 5
```

```
      READ(5) (AM(J),J=1,NOX)
  235 DO 32 J=1,NUM
      M= J + (J-1)*NUM
      GO TO (33,34),JX
   33 AM(M) = DIAGA(J)
      GO TO 32
   34 AM(M) = DIAGA(J)
   32 CONTINUE
      WRITE(3,200) JX
  200 FORMAT(////'MATRIX ',I3//)
      CALL PRRAY(AM,NUM)
      CALL MINV(AM,NUM,DET,D,P)
      IF(DET) 300,301,300
  301 WRITE(3,302)
  302 FORMAT(' MATRIX DETERMINANT IS ZERO')
  300 WRITE(3,202) JX
  202 FORMAT(' INVERTED MATRIX',I4)
      IF(JX - 2) 211 ,210,211
  210 WRITE(4)(AM(I),I=1,NOX)
C  COMPUTE A-1*1.6E4*BOD LOADS
  211 DO 203 J=1,NOX
  203 AM(J) = AM(J)*1.6E4
      CALL PRRAY(AM,NUM)
      DO 204 J=1,NUM
  204 XLOAD(J) = 0.
      IF(JX - 1) 216,205,216
  205 WRITE(4) (AM(J),J=1,NOX)
  216 IF(JX - 1) 217,217,218
  217 DO 219 J=1,NUM
  219 XLOA(J) = BOD(J)
      GO TO 220
  218 DO 221 J=1,NUM
  221 XLOA(J) = - SINK(J)
  220 DO 206 I=1,NUM
      DO 207 J=1,NUM
      M = I+(J-1)*NUM
  207 XLOAD(I) = XLOAD(I) + XLOA(J)*AM(M)
  206 WRITE(3,208) I,XLOAD(I)
  208 FORMAT(' SEGMENT (',I2,') ... XLOAD =',E15.5)
      GO TO 130
   36 END FILE 4
      REWIND 4
      READ(4) (AM(J),J=1,NOX)
      DO 232 J=1,NUM
      DO 232 I=1,NUM
      M= (J-1)*NUM + I
      BM(I,J) = AM(M)
  232 CN(J,I) = 0.
      READ(4) (AM(J),J=1,NOX)
      DO 233 J=1,NUM
      DO 233 I=1,NUM
      DO 233 K=1,NUM
      M = J + (K-1)*NUM
  233 CN(J,I) = CN(J,I) + BM(K,I)*AM(M)
C
C  NOTE THAT A AND B MATRIX NOTATION IS REVERSE NOTATION OF DEL BAY
C  FROM HERE ON ....... ...............
C
```

```
      DO 234 I=1,NUM
      DO 234 J=1,NUM
      M=J + (I-1)*NUM
      BM(J,I)= AM(M)
  234 AM(M) = CN(J,I)
      CALL PRRAY(AM,NUM)
      DO 400 J=1,NUM
      DO 400 I=1,NUM
      M= I + (J-1)*NUM
  400 AM(M) = AM(M)*V(J)*DECAY
      CALL PRRAY(AM,NUM)
      DO 241 J=1,NUM
  241 SUMBOD(J) = 0.
      DO 240 J=1,NUM
      DO 240 I=1,NUM
      M = J + (I-1)*NUM
  240 SUMBOD(J) = SUMBOD(J) + BOD(I)*AM(M)
      WRITE(3,258)
  258 FORMAT(////'1FINAL PREDICTED D.O.  ....'/ 10X,2X,8X,'PREDICTED =
     1     SAT D.O. +      XLOAD  -    SUMBOD'//)
      DO 252 J=1,NUM
      CONC(J) = CS(J) + XLOAD(J) - SUMBOD(J)
  252 WRITE(3,253) J,CONC(J),CS(J),XLOAD(J),SUMBOD(J)
  253 FORMAT(' SEGMENT (',I2,')  ',E15.4,5X,3E13.4)
    8 FORMAT('1SECT      DIAGONAL            RC          VOLUME          BOD
     1        TEMPS           SINKS        LOADS           XKX'//)
      WRITE(3,8)
      DO 55 J=1,NUM
   55 WRITE(3,5) J,DIAG(J),RC(J),V(J),BOD(J),TEMP(J),SINK(J),XLOA(J),XKX
     1(J)
    5 FORMAT(2X,I3,8E13.4)
  100 CALL EXIT
      DEBUG SUBCHK(AM,BM,CN,SUMBOD,CONC,XLOAD,DIAGA,DIAG,Q,AREA,XLOA)
      END
```

DR. EDMISTEN: Thank you. This report in essence states that we have taken the Delaware River model and modified it to fit the 2- dimensional nature of our estuary. We have checked the function of the model with theoretical figures and we found it to be functional. We are currently involved in a massive sampling program of the physical and chemical parameters of the bay in an attempt to test the function of the model with real figures. This massive sampling program involves the expertise of Dr. Tom Hopkins, Chairman of the Biology Faculty, and two of his advanced Master degree students.

I might add as an aside here, as a result of your conference last year, and we thank you for it, we have had such wonderful cooperation, as exemplified by the fact that this houseboat that Dr. Smith talked about earlier is the vehicle that we are using right now to get this data and we are using the 3,000 bucks from local industry to pay for this current data sampling program. And, of course, we will take this data and put it to our computer model and see how it stands up under real live data, real temperatures, real salinities, real dissolved oxygens, real nitrates.

We feel that the ultimate answer to the pollution problems of Escambia Bay will be found in the final version of our math model. These answers will involve a diverse series of activities, such as upland spray irrigation disposal, large holding lagoons for tertiary treatment, consolidated sewerage systems, and a plan for the development of the shorelines of our bays and islands.

Now, in this upland irrigation spray business, I am currently corresponding with Campbell Soup Company in their Paris, Texas, plant that the scientists from Escambia Chemical told me about and gave me all the reprints on. I would like to commend Escambia Chemical for their steps forward in holding lagoons and investigating the idea of upland spray irrigation.

This business of the shoreline development is the next thing that is our major task at the University of West Florida.

The second major activity, that of the shoreline plan, is being studied right now. Originally our graduate students had planned to produce the entire study and the plan for the development of the shoreline by themselves, but with the involvement of the Escambia-Santa Rosa Regional Planning Council alongside with the Santa Rosa Island Authority, both of them putting up $15,000 each, and more money forthcoming, we have decided that we will handle just the environmental input for this.

With this financial involvement and commitments by the Santa Rosa Island Authority (SRIA) and the Escambia-Santa Rosa Regional Planning Council (ESRRPC), our students have narrowed the scope of their problems to that of defining the biological communities, their functions and their weaknesses and best uses around the bay. In other words, we are going to see just what is there, how much grass is still on the bay like it used to be 50 years ago, what other vegetation types are around, the bay heads, the sand hills, what is a sand hill best used for, what is a flat woods best used for, like around Avalon Beach. It is now envisioned that some professional consulting firm such as Milo Smith and Associates, now bidding on the job, will utilize these biological and ecological inputs, matching them with economic, demographic, cultural and social factors, ultimately producing a plan for the proper development of our shorelines.

In addition to these two major projects, Dr. Hopkins and his staff have been deeply involved in their continuing reserach in the biology of Escambia Bay and Bayou Texar.

Three of my graduate students are doing their research on projects related to our problems in and around Pensacola and Escambia Bay. Mrs. Betty Bohannon is documenting the degree and extent of nitrogen fixation by organisms in the bay water and mud. It is interesting right here that you should note this, that a young man over at Gainesville, Florida, Dr. Patrick Brizonik, who is with the Department of Environmental Engineering, has used a similar test that Mrs. Bohannon is using to test the nitrogen fixation in Waccasassa Bay. Now, the mud bottoms and waters have a natural ability to fix nitrogen and this young man, Patrick Brizonik, has found that there was 3.1 million kilograms of nitrogen fixed by the bay bottom in Waccasassa last year.

Now, does this get industry off the hook or put them on deeper? Think about that for a moment. It gets them off the hook to a certain extent in that there is a lot of nitrogen fix out there in our bay right now, because Mrs. Bohannon's tests have been positive and paralleled those of Dr. Brizonik, but at the same time if we have all of this nitrogen input, if we have in that 7 - square kilometers of Waccasassa 3.1 million kilograms of nitrogen, which translates over to about 7.4 million pounds in that 7 - square kilometers, then we have a comparable amount here. So if there is all that much nitrogen input just to the bottom organisms, then it puts industry back on the hook again.

The point I am trying to make is that we have got to look at the total function of this and other bays with such a tool as the math model I have been talking about. We have got to get it all into proper perspective.

I have another Master degree student, Mrs. Margaret Green, who is working to establish the normal and/or abnormal nitrogen cycles of salt marshes. She is studying one salt marsh just to the north end of Escambia Bay and as a control she is studying another salt marsh and its nitrogen cycles around the corner in the headwaters of Blackwater Bay near Milton.

The third graduate student under my supervision, Mr. Dwaine Raynor,is studying the types and extents of vegetation around Escambia Bay as mentioned earlier.

I want to close by thanking you for getting the ball rolling.

Thank you. Any questions?

MR. REED: Thanks, Joe.

MR. PATTON: Joe, I have one comment. I think what I heard you say a minute ago, if I can rephrase your words, is that in effect these estuaries are rather delicately balancing their certain, quote, natural inputs.

DR. EDMISTEN: Yes, there is--

MR. PATTON: And when man starts using them as a sink for his waste on a rather indiscriminate basis, it doesn't take long for things to really go to pot.

DR. EDMISTEN: With the tremendous amount of nitrogen fixation in there, as evidenced by Brizonik's work and my students' work, they are easily eutrophied just on their own scale, their own time, so we have got to take care that we don't speed up this eutrophication. I am sure that we never have properly implicated the farmers and the farming industry in upper Escambia County and the runoff there.

Another one of my graduate students is doing work finding a super legume, which we might use for fertilizer some day rather than throwing tremendous amounts of mineral fertilizers on and letting it run off and, therefore, further eutrophying the bay.

MR. PATTON: Do you have any good thoughts on how we can control the runoff, agriculturewise?

DR. EDMISTEN: Yes, I do. As a matter of fact, we can control that by having more judicious use of fertilizers, by using more legumes, and that is precisely what my student Mr. Aubrey Morris is doing his Master's degree on, finding this super legume.

MR. REED: I wish you luck with the Department of Agriculture. (Laughter.)

MR. TRAINA: Joe.

DR. EDMISTEN: Mr. Traina.

MR. TRAINA: As you fellows have been here for quite a while in this bay, I am going to ask you a question I earlier addressed to Dr. Smith.

Do you really think that the bay can take any more artificial inputs of nutrients? Now, I can appreciate the fact that we need to look at not only Escambia Bay, but look at that in respect to Pensacola Bay and the entire area. It concerns me that perhaps we may be setting ourselves in a direction here of thinking about how much more materials can Escambia Bay take considering what it has now.

DR. EDMISTEN: One might assume that from the title of our computer study, that is the safe assimilative capacity of Escambia Bay, one might assume that we are looking to see how much more we can dump in it, but that is not the case. We are looking at a totally objective picture to see just what it can take. Now, my research and training is largely in upland ecosystems, I know the vegetation types of Florida as well as any person, but I am not an expert in water. Dr. Tom Hopkins is really our expert at the University of West Florida.

So I would say I want to be entirely objective, I want to look at our computer model. It would be an emotional thing for me to say that it can't take any more at all and that is what I would like to say, but I am going to be very scientific, very objective. We are going to complete this computer model; we are going to let it speak for us.

MR. PATTON: Perhaps you ought to underline that first word in the title, Joe, "Safe."

DR. EDMISTEN: Yes, safe assimilative capacity.

MR. TRAINA: One other comment or question I would like to direct to you.

These conferees are very much concerned about reestablishing Escambia Bay. There has been some thought among us publicly and other places regarding what we can do to restore the bay, and I am not talking here just about controlling waste discharges, I am talking about methods of looking at the bay bottom and doing something there.

In any of your planning and studies to date are you going to look at this angle? Are there going to be mechanical or other ways of restoring portions of this bay? I am talking about the bottom materials that were put on this morning.

DR. EDMISTEN: Yes, we considered several alternatives, such wild Buck Rogers sort of things as cleaning up the bay. Suppose for a moment that you just absolutely dredged out and cleaned up the bottom and carried all these PCB bearing wastes away and put them upland where fungal activity might help degrade them faster. Well, this is one possibility.

Still another possibility is that of using grasses, underwater vegetative grasses such as Thalassia testudium and actually vegetating the bottom again.

Yes, we are considering all sorts of possibilities for renovating and reclaiming the bay.

MR. TRAINA: Would you venture a guess if we stopped discharges tomorrow how long the bay would take just to naturally stabilize, the bottom to stabilize? Would you like to venture a guess on that?

DR. EDMISTEN: It would be just that, it would be just a guess, because I am only human. (Laughter.)

MR. TRAINA: Yes, I know. So are we. We have been struggling with that one for a long while.

DR. EDMISTEN: Due to the nature of the bay, with the Santa Rosa Island across the mouth of it and the poor flushing rates, its natural eutrophication has helped it to this stage and it is not really going to get any better. We might gradually have more sand and silt seal this over, all this mud and muck down there, and if it were sealed over, of course, it would still be very natural. You know that most of the bay is only six or eight feet deep across there, and that is not industry's fault, it is geomorphology's fault. It would never really get clean and open again. Natural eutrophication would just keep it going on, filling in. Its ultimate goal, its ultimate fate, is that of being filled in. It would never--I mean hundreds of years, thousands of years, it would just gradually get more shallow, gradually get more filled in. I am sure--

MR. TRAINA: That is happening at a pretty rapid pace now because of man's activities.

DR. EDMISTEN: Of course we are accelerating it. Of course we have accelerated it. What normally takes thousands of years we have done in 10, 20, 30 years.

MR. TRAINA: So you think the best we can do is just slow it down?

DR. EDMISTEN: Yes, we can slow it down if we don't do anything else, but its ultimate fate is that of filling in.

MR. REED: Joe, not disregarding for a moment the natural evolution of these bays, I think there is genuine feeling, though, by many of us if we can minimize the effluent that we will be able to return the bay to some form of productivity in a fairly rapid matter of time. Professor Odum at the University of Georgia has been involved in this.

I think it might be useful for everybody in this room to know how many hundreds of hours, and I mean hundreds of hours, the men at this table and other men in our department and the Federal Government have spent thinking about Escambia Bay. I don't think anybody in this room has the slightest concept of the number of people who are thinking and working on this project throughout the Southeast. This is, I guess, one of our maximum attentions in this State, certainly in our Department. We have discussed the dredging of the bay; we have discussed the regrassing; we have done so much of this ourselves as well. We have great hopes that we will be able to return the bay to some form of productivity.

DR. EDMISTEN: I am sure it can be returned to a healthy state. Now, you can't expect it to have suddenly pure running waters, but it can be returned to a healthy state by the combination of biological and physical removal methods.

One of the things that we really should consider is means of taking all of these nutrients and removing them biologically. If we have a big consolidated sewage treatment plant, we can't destroy nitrates or phosphates. As you well know, if the plant is operating well it just simply breaks out the phosphates and nitrates and nutrients, which make them even more available.

So if we have bigger and better sewage treatment plants we have got to go to some tertiary treatment, like--was it Mr. Locke talked about it? He didn't give the University of West Florida credit. You notice I was rather heavy on the West. Our sewage treatment plant up there does have good fish in it and I have consumed them and they are quite good. There is no reason why we can't follow the example of the Fort Lauderdale area, where they are taking all of their sewage treatment plants and tying them into an open spray irrigation plant. We have the deep, sandy, porous soils that are very suitable for this.

MR. REED: We have dozens of them going in across the State now. Tallahassee City. Mr. Bouten is very keen on upland disposal of sewage treatment and we are requiring it in many, many instances around the State.

DR. EDMISTEN: Of course, as you realize, Mr. Reed, this is not just a matter of dumping it in the land, it is chemically removing those materials that are beyond the capabilities of in-plant removal. Mr. Lipe was up talking about they are approaching their technical limits of removing nutrients, so if you biologically remove them by fish, turn them into fish, turn them into pine trees, turn them into grass, as the Campbell Soup Company is doing, then they don't go into the bay or into the Gulf of Mexico.

Well, I have taken enough time.

MR. TRAINA: I would just say, I would like for you to pursue these alternatives, because this is where we are going, to get back to my initial question. I think this is where we need to go, is to come up with some of these proposals of putting these effluents after treating them in other places.

Thank you.

MR. WHITE: Thank you very much.

Yes.

MR. PATTON: I would like to make one observation here. The question was asked of Joe a moment ago about recovery of the bay, and I think this is one of the most difficult questions that a sanitary engineer is ever called upon to answer.

I know from personal experience that Bayou Chico, on the west side of the city, experienced a very bad situation a number of years ago. Industries were discharging into the bayou, very much a land locked bayou, bottleneck, sludge banks were over 20 feet deep extending above the water surface, and after treatment was put in to remove this waste it wasn't too long until the sludge banks began to disappear. That bayou is not pristine pure, but I think its condition today compared to, say, 1955 or 1956, it is practically nothing short of a miracle and it happened very quickly.

If any of you want to know how this can be damaged, come by my office and look at a piece of mahogany that the teredo worms bored lots of holes in.

DR. EDMISTEN: That is very encouraging. Thank you.

MR. REED: That is all, Mr. Chairman, I have, unless there is anyone who wants to speak in the name of Florida.

Is there anybody else in the room who wishes to come forward at this time?

Otherwise, I will turn the meeting over to you, Mr. Chairman, for the Alabama presentation.

MR. WHITE: Thank you very much, Mr. Reed.

Before getting into that, I would like to offer one comment as a followup on this exchange about the possibility of recovery. I think you can get several different theories advanced from any number of scientists. One thing remains clear, that we are going to have to get these waste discharges out or reduced to the maximum extent possible and then evaluate the situation after this occurs and hopefully we will see some hasty recovery at that time.

Before going into the Alabama presentation, I would like to call a brief recess and reconvene at 5 minutes of 4.

(RECESS)

MR. WHITE: Let's reconvene, please.

I would like to now call on Mr. Arthur Beck for the Alabama presentation.

MR. BECK: Thank you, Mr. Chairman.

Dr. R. L. Myers, the Chairman of our Alabama Water Improvement Commission, has asked that I express his regrets that he couldn't be here as the conferee from Alabama, but he has budget troubles and he must appear before the budget committee today and tomorrow. That is most important with us so he has asked me to serve in his place.

I am going to ask Mr. J. L. Crockett, Director of our Technical Staff, to give Alabama's presentation.

Joe, if you will.

J. L. CROCKETT, JR., DIRECTOR
TECHNICAL STAFF, ALABAMA WATER IMPROVEMENT
COMMISSION, MONTGOMERY, ALABAMA

MR. CROCKETT: Mr. Chairman, conferees, ladies and gentlemen.

I am J. L. Crockett, Jr., Director of the Technical Staff of the Alabama Water Improvement Commission, and I am pleased to present this statement on behalf of the Commission.

The recommendations of the conferees following the first session of this conference held in Gulf Breeze, Florida, January 20-21, 1970, specifically relating to sources of pollution within the State of Alabama were:

1) That the mill of Container Corporation of America, located near Brewton, Alabama, reduce its discharge of carbonaceous wastes to the extent of 90 percent by not later than December 31, 1972.

2) That color in the Escambia River at the Alabama-Florida state line, as measured at the Highway 4 bridge near Century, Florida, shall be reduced to meet levels of Alabama, Florida, and Federal standards. No time limit was set on that particular recommendation.

3) That the town of East Brewton, Alabama, shall

J. L. Crockett, Jr.

install secondary waste abatement facilities acceptable to the Alabama Water Improvement Commission by not later than December 31, 1972.

It was also recommended that the conferees, after evaluation of material presented for the record of the first session of this conference, and after consultation with the parties involved, establish allowable waste discharges for each of the major contributors of waste to the waters involved. A meeting of the conferees was held for this purpose in Atlanta, Georgia, on May 14, 1970, at which time representatives of the major waste contributors met with the conferees and presented statements. It was decided by the conferees to take this matter under advisement and to meet again early in 1971 for the purpose of reaching decisions on allowable discharges. It is our understanding that this session of the conference has been convened for the purpose of evaluating progress made during the past year in abatement of pollution of waters covered by this conference.

Our presentation will consist principally of discussions of the status of Container Corporation of America and the town of East Brewton, Alabama, as to progress made in complying with the recommendations of the conferees.

The waste treatment system of Container Corporation, as it existed in January 1970 was described in detail in our statement during the first session of the conference and need not be repeated. It will be recalled that during this first session, Mr. George H. Whiteside, General Manager of the Brewton Mill, Container Corporation, stated that his company was in the process of constructing an aerated lagoon to supplement treatment facilities then in effect. This aerated lagoon, which will be described in detail by the representative of Container Corporation who will appear before you, was completed and placed in operation during October 1970. During August 1970 prior to the activation of the new aerated lagoon, the Southeast Water Laboratory of the then Federal Water Quality Administration conducted an investigation of Container Corporation's existing waste treatment system, this system at that time being the same at that time as we described to you last January. The results of this investigation have been reported to you, and it is interesting to note that the removal of 5-day BOD determined by this investigation was 81 percent, a value approximating that reported to the first session of the conference in January 1970. Unfortunately, a restudy of Container Corporation's waste treatment system, including the new aerated lagoon, could not be scheduled prior to the advent of cooler temperatures which are accompanied by lower biological activity. The expanded waste treatment system will be evaluated by the Southeast Water Laboratory during 1971. In the meantime, Container Corporation will continue its monitoring of the waste treatment system with results being reported periodically to the Water Improvement Commission.

At this point in time, any statement as to the overall efficiency of Container Corporation's expanded waste treatment system in the removal of 5-day BOD must be based on one's experience and judgment. Nevertheless, we feel confident in predicting that the system will provide a reduction of at least 90 percent of the 5-day BOD generated by Container Corporation during the warmer seasons of the year when biological activity is at its highest. We do not feel that this degree of removal can be maintained during winter months when biological and bacterial action proceeds at a much lower rate.

The determination of allowable discharges by Container Corporation as well as other waste sources involved in this conference deserves and should be given careful consideration with all factors being fully evaluated. The report of the Environmental Protection Agency takes account of the fact that the average generation of 5-day BOD as determined from the Southeast Water Laboratory study of August 1970 for Container Corporation was approximately 19 percent below the average for similar mills operating in the South. This finding corroborates those of previous studies of this mill and can be attributed to a tight operation or in-plant control of waste losses. This should be taken into account in determining quantities of BOD Container Corporation may be permitted to discharge in the future if operations similar to those of Container are to be judged on the basis of the industry average. The EPA report further recommends that the effects of an expansion in pulping capacity presently under way at Container Corporation's mill be evaluated and reviewed by the conferees in establishing an allowable BOD discharge for the company. This expansion will result in an increase of 150 tons per day in pulping capacity.

Total organic carbon and its role in water quality degradation was discussed at length by representatives of the Federal Water Pollution Control Administration during the first session of this conference. It is again mentioned in the report of the Environmental Protection Agency to this session with recommendations for permissible quantities of TOC which can be discharged by Container Corporation. We submit that the role of TOC is not fully understood and technology relating to its removal by treatment has not developed to the point that practical and reasonable conclusions should be drawn today as to permissible discharges.

With respect to color in the Escambia River attributable to Container Corporation, we remind you of the commitment of the Alabama Water Improvement Commission to require reduction of color in the waste discharged by Container Corporation when an economically feasible method for doing so is developed. We also remind you of the commitment of Container Corporation to incorporate color removal in its waste treatment system when a commercially feasible method of doing so becomes available. Color removal in pulp and paper mill waste is still under investigation and it may be a year or two or more before I think we will have the results of these several studies and demonstration practices.

The town of East Brewton, Alabama, population 2,336, 1970 census, contines to discharge untreated wastes to Murder Creek, a tributary of the Conecuh River, at a point approximately 12 miles from the Alabama-Florida State line. This municipality is under order from the Commission to provide secondary treatment facilities and has retained a consultant to study and design an appropriate system. It is suggested that the conferees reaffirm their position that East Brewton be required to install secondary treatment facilities at the earliest possible time, but by not later than December 31, 1972.

If I recall correctly, the two speakers that preceded me have mentioned sediment in the streams of their area, those streams that are involved in this conference. I do not recall whether the Conecuh River was mentioned specifically, but I would like to remind you of the fact that we did report to you last January on the operation of sand and gravel washing facilities in Alabama. We can again report that these sand and gravel washing operations are essentially removing the turbidity created in their works and I do not feel that manmade activity or, rather, activity of man is contributing significantly to the discharge of sediment from Alabama sources into the Conecuh-Escambia River system. I think we also reported that there were other sand and gravel operations that are not in Alabama which may or may not be a source of sediment to this stream.

Before completing my statement, I would like to advise the conferees that the Mayor of East Brewton, Alabama, and his consulting engineer had been invited to attend this conference and had agreed to do so. They did ask, well, could we delay it until Tuesday. So unfortunately they will not be here today to be heard. I would hope that the Chairman will permit them to file a letter if they so desire.

MR. WHITE: If they make their wishes known, we will be happy to have them submit something for the record.

MR. CROCKETT: Thank you.

MR. BECK: Are there any questions of Mr. Crockett?

MR. WHITE: Any comments?

MR. TRAINA: Joe, I would like to explore with you this question of 90 percent BOD removal during the wintertime. As you know, the study that we did that was reported on by Mr. Little this morning was done during the summer period, and the plant was getting 81 percent removal of BOD at that time. Now, this was prior to the--maybe the company will report back here later--that was prior to putting in the aerators. Don't you think with aerators that we could get, expect, a 90 percent year-round reduction of BOD?

MR. CROCKETT: I cannot commit myself to that. I think that we have had as much experience as probably any State in the South on the operation of biological treatment systems for pulp and paper mill wastes and for that matter any biological system, and invariably you get a reduction during the colder months of the year.

I have simply said that I did not feel and I could not commit myself to 90 percent removal in the middle of the winter. Personally, I think there would be a reduction, but how much I do not know. I did say that--I will say I would rather put it "we," because our staff is confident that with the addition of the aerated lagoon it will easily accomplish the 90 percent removal and it may just exceed it.

I have no doubts but what it will be met during the greater portion of the year, but I still have considerable reservation as to the operation of any biological waste treatment system being able to consistently deliver the same degree of removal throughout the 12 months season or period.

MR. WHITE: May I ask a question here, Mr. Crockett?

The basis of design, then, would be your critical low periods in the summer, would they not?

MR. CROCKETT: Well, your basis of design, it depends upon what factor you are considering there, Mr. White. If you are considering a stream, of course the 10-year 7-day low flow governs. But we are committed to secondary treatment of waste in Alabama.

MR. WHITE: But would not your policy that you presently operate under require that you design for the 7-day 10-year low flow?

MR. CROCKETT: That is correct.

MR. WHITE: Under these circumstances, then, likely you are getting this type treatment during this critical time that this flow would occur, which normally is during the hot dry months.

MR. CROCKETT: During the warmer months.

MR. BECK: Didn't you say, Joe, that we will meet it or the company can meet it at that critical loads that occur in the summertime?

MR. CROCKETT: This is what I have said in my statement, that it is my opinion that we will definitely meet the 90 percent, the company, Container Corporation, with the addition of its aerated lagoon. I have made the other statement concerning the efficiency of such a system, not only Container's but any biological system that we have operated in the State, of the ability of that system to maintain the same degree of efficiency in BOD removal during the colder months of the year as it can show during the warmer months. It is simply a fact of nature.

MR. TRAINA: Joe, one other question. Well, maybe two other questions.

With regard to the TOC situation--and of course we have been through this thing a number of times,we had some discussion this morning of the Florida people on this--are we talking about a question of methodology, analytical methodology, or a question of technology in terms of removing these materials?

MR. CROCKETT: From what I have heard of TOC, that is the methodology of its determination, I think Container Corporation was the first mill of the pulp and paper industry, certainly in this region, and perhaps the first in the industry to purchase equipment to measure TOC. As a matter of fact, I think it was under order within 10 days after the conference session last January. And I am told not only by Container people, but I have heard from others, that there is some question about the methodology. Maybe--I am not an expert in this area; I am simply repeating what I have been told.

Now, as to whether or not a biological system that we may design for 90 percent removal of BOD is going to accomplish 90 percent removal of TOC, I think that you had better give that a lot of thought before you express yourself.

My feeling, and there again based on what I can hear, is that it won't perform that professionally in the removal of TOC. We are in a new game with this TOC, and I think we have got some things to learn about it, and with that in mind I think we should proceed cautiously. We can always come back and set such standards as we think can be accomplished.

MR. TRAINA: I take it that Alabama has perhaps the same problem that was discussed by Florida people earlier with regard to their own regulations—that provisions for TOC are not in the regulations, not in the permitting system.

MR. CROCKETT: We have been accused of taking certain liberties. Personally I look at our law and we are responsible for the control of wastes and TOC is not defined specifically. We might be taking liberties, but I am sure we will take them if that is a critical element in the control of water quality.

MR. TRAINA: Very good.

MR. REED: Let me ask you a question about that. You are all experts on other State standards. How many other States have a TOC standard, just out of curiosity?

MR. TRAINA: Probably none.

MR. REED: I didn't want to feel backward alone. (Laughter.)

MR. WHITE: Mr. Crockett, I don't want to belabor this point or pass over it, but in designing your system you consider two factors, don't you? I mean you consider imposing your effluent requirement which the State has, which, in effect, is the secondary treatment requirement; also you consider the stream conditions and you design for the minimum criteria that you have in the stream. In this particular case is the design based back from the stream to preserve the minimum of DO 4 parts per million at the critical low flow periods? Am I making myself clear?

MR. CROCKETT: I think so, Mr. White. In all evaluations--and I am going to speak specifically to the point of Container Corporation--in all evaluations that we have made on the potential effect of Container's wastes on the receiving stream, it has been based on the preservation of a minimum of 4 parts per million DO at the sag point. Originally I would probably have to say, and this is going back into the 1950's, that flow-wise we considered the 95 percent flow is the immediate flow and that may have cut off once every two years. More recently, in consideration of Container's discharge, we are going to have to consider, and so is Container, the 10-year 7-day low flow in order to preserve the quality of the water, and Container will have to take a look at it to try to devise their system to accomplish that end in order to continue production.

MR. WHITE: I just wanted--excuse me.

MR. CROCKETT: I don't know whether I have answered your question, but we are actually--and frankly, this whole matter of secondary treatment which we are into now, you have to design a little bit higher removal to get the removal that you can consistently deliver. That is going to be a legal factor in your permit system.

MR. WHITE: Well, I appreciate the response. I wanted to make the point that we do have a dual standard here, we have an effluent standard that we are developing, and we have a stream standard that also comes into play.

MR. CROCKETT: I think we are certainly getting into the effluent standard--we have been in the effluent standard business whether we admit it or not, but the two go jointly hand in hand. You can't separate the two when you are in this business of water pollution control.

MR. WHITE: Well, very briefly, again, I would like to ask a couple more questions, and these may be covered by the company's report.

When will they have the increased capacity effective?

MR. CROCKETT: Let me defer that to Mr. Whiteside.

MR. WHITE: O. K.

MR. TRAINA: On that point, Joe, could I ask, has the company applied for a permit?

MR. CROCKETT: That is correct, they have furnished us with the data which should--the permit will not be issued until after the system is in operation.

MR. TRAINA: I see. O. K. Thank you.

MR. WHITE: One other comment. On East Brewton, can you give us any prognosis on this? Do you think that we are going to get a report which would indicate they are going to meet the deadline established by the conferees?

MR. CROCKETT: I had a telephone conversation with the consulting engineer last Friday, I believe, when I arranged for him to be here so he could tell you these things. At the moment the consultant has completed his preliminary engineering report. He did tell me that there had been some discussions with financial houses and that the town had been advised that provided they could get Federal assistance in construction both--in this case they are going to have to have sewage treatment and they will need additional source so as to build up the revenue to meet the bond issue requirements. Provided the town can get some assistance from the Federal agencies, there is no doubt but what it can finance this program.

I can't go further than that. We do have a different administration in the city government in East Brewton and they appear to be more progressive, let's say, than the previous administration.

MR. TRAINA: Joe, do you think in their submission to the conferees that they could give us a time schedule? I thought you had indicated that the city officials were going to give us a letter of some sort. Do you think that will include a time schedule for secondary treatment?

MR. CROCKETT: I don't know that they would be in a position today to give you a time schedule. I don't know that the plan has gone that far. Certainly my suggestion, it was made as a suggestion, I will make it as a recommendation, that the conferees reaffirm their position.

MR. BECK: Joe, don't we have the town under orders?

MR. CROCKETT: The town is under orders, that is correct, as I have stated in my presentation. We would try to speed them up and we would like to see it done in 1971.

MR. BECK: The point I want to bring up, that the Water Improvement Commission is not dragging its feet on it?

MR. CROCKETT: The town has drug its feet and I think we will all have to admit.

MR. TRAINA: I think we will just have to take note of that, as you have recommended that we do.

MR. REED: Joe, I don't know how the PL-660 money is handed out in Alabama. Does that go through you, in your department?

MR. CROCKETT: It does.

MR. BECK: They want more money than that, though, Mr.

Reed, they want HUD money and they want EPA money, they want 90 percent.

MR. REED: We have got some like that too.

MR. CROCKETT: Probably to answer your question, there will be no difficulty with PL-660 money.

MR. REED: Joe, are you a 35 percent State or a 50 percent State on those grants?

MR. BECK: We are 30 percent.

MR. REED: 30 percent.

MR. CROCKETT: We are hopeful that legislation will be proposed whereby the State will go into a program of financial assistance, but every time you turn the corner now it is "Where is the revenue coming from?"

MR. REED: Yes, we have the same thing.

MR. TRAINA: Joe, I assume from your comments that the sand and gravel situation has been all cleaned up and there are no problems here?

MR. CROCKETT: The sand and gravel situation is that the problem is one that you must continuously be on top of. These are small operators, in the main. For that reason we have assigned one staff member solely to such operations as sand and gravel and it just takes repetitive visits. We have one now, and I said it is essentially being controlled, we have one operator who is a little backward and it just takes repeated--

MR. TRAINA: Is he on the Escambia?

MR. CROCKETT: He is on the Big Escambia Creek, yes.

MR. REED: Are these dragline operations?

MR. CROCKETT: Mr. Reed, primarily sometimes they always use shovels, but I don't think any of them use--I could be in error on that dragline, but they use mechanical equipment, usually shovels. The pits will be near the Florida streams. Sometimes it is taken from a Florida stream by dredge.

MR. BECK: Joe, isn't our problem mainly washing?

MR. CROCKETT: It is the washing of it, washing of what is generally termed bank run sand and gravel in which the sand and gravel include clays and loam that you have to wash out before you can market it. The material that is removed by dredges from the bottom of the streams is considerably cleaner and doesn't always require washing.

MR. WHITE: Any other questions?

Thank you, Mr. Crockett.

MR. BECK: Mr. George H. Whiteside, General Manager of Container Corporation of America.

Mr. Whiteside.

GEORGE H. WHITESIDE, GENERAL MANAGER
CONTAINER CORPORATION OF AMERICA
BREWTON, ALABAMA

MR. WHITESIDE: Mr. White and conferees, ladies and gentlemen.

I am George Whiteside, General Manager of the Brewton, Alabama, mill of Container Corporation of America.

Mr. Chairman, our statement at this conference is divided into two parts. The first is a progress report on our water pollution abatement accomplishments and activities since the conference met on January 21, 1970. This report will be of interest to everyone here today, so I will present it orally.

The second section is a compilation of pertinent technical data. Although important, it will be of interest primarily to just the conferees and can be studied more completely at a later time; therefore, I would like permission to have it inserted into the public record without oral presentation.

MR. WHITE: Without objection, it will be entered into the record as if read.

(The statement referred to commences on page 318.)

MR. WHITESIDE: This progress report details

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improvements made in our water effluent treatment system at the Brewton Mill since January 1970. In addition, it will discuss research and development work now scheduled or planned for implementation after this session of the conference.

In-plant control. And by in-plant control, I mean recovering to where we use it within the system.

On January 20, 1971, we reported to you that our pulping operations prior to any effluent treatment were generating 56,800 pounds of BOD. Because of the adoption of extensive in-plant controls, this figure has been reduced to 48,500 pounds as determined in a joint study conducted last August by the combined research personnel of the FWQA and Container Corporation of America. In other words, the BOD load we produce was reduced from 63 to 54 pounds per ton of product. When one considers that 61 pounds of BOD per ton is the average for southern kraft mills producing an even mix of bleached and unbleached paperboard, it is patently clear that we have gone from a position which was slightly above the industrial average in terms of BOD production to one which is significantly below that average.

This achievement has been made by increased reuse of our process waters as the result of changes which have closed up our water systems. Foam breakers and pneumatic level recorders have been installed in tanks susceptible to overflow

G. H. Whiteside

and sewer lines have been rerouted to minimize the adverse effects which could result from accidental tank overflows. Pumps, valves, and miles of pipeline are continually subjected to inspection and maintenance in an effort to reduce leaks capable of contributing to the pollution load. Blow steam condensate has been piped to the black liquor system in order to contain any entrained contamination in that system.

The aeration system. This is our new system.

Our statement to the conference on January 21, 1970, mentioned the installation of a system of mechanical aerators to improve treatment of our effluent. This system was completed in September 1970 at a cost of $750,000 and was placed in operation on October 11, 1970.

The aeration system consists of a specially constructed midfeather 22-acre lagoon which is 10 feet deep. It has a normal operating capacity of 60 million gallons. Effluent enters the lagoon after being treated in the solids removal clarifier. The aeration lagoon contains 10 75-horsepower Eimco surface aerators which bring the dissolved oxygen content of the effluent up to 6.5 parts per million at the point where the effluent enters oxidation ponds. Performance data on this system are being compiled and will be presented to conferees when available. The system is now in continuous operation. We are convinced that it represents a significant step forward in our continuing water pollution abatement effort.

Federal Water Quality Administration Study.

Between August 17, 1970, and August 28, 1970, FWQA research personnel and Container Corporation personnel conducted a river and waste treatment survey. Our purpose was to establish a base line for evaluation of the treatment efficiency of the aeration system.

It was originally hoped that the study of aeration efficiency would be completed in time to present results at this reconvening of the conference. However, this has not been possible. Data will be presented as soon as it is available.

Institute of Paper Chemistry Benthological Study.

During the fourth week of July 1970 stream biologists from the Institute of Paper Chemistry in Appleton, Wisconsin, conducted the 14th annual biological water quality study of the Conecuh-Escambia River between Brewton, Alabama, and Escambia Bay, Florida. As in previous studies, the purpose was to measure the effect of treated pulp and papermaking wastes from the Brewton Mill upon the biological resources of the receiving stream.

Comparison of data obtained with that collected in previous years permitted the biologists to conclude: "...that a major improvement in the water quality of the Conecuh-Escambia

River downstream from Container Corporation of America's Brewton Lake outfall has occurred since the 1969 study was conducted. A complete ecological recovery from the effects of Brewton Lake discharges, and a return to a normal water quality was apparent 3.1 miles downstream from the outfall which is near the mouth of Little Escambia Creek." We must point out, however, that the report also noted, "The water of the Conecuh River remained darkly colored, although no other physical impairments were discernible during this study."

Color.

As we stated at the last conference..."We understand that we will be expected to employ the use of (a) color removal system whenever a reasonable method is devised."

We are concerned about the river's discoloration and have pursued our continuous investigation and evaluation of all color removal methods currently being tried or suggested for use on kraft mill effluents. We must, regretfully, report to this conference, as of today, no economically feasible method of color removal exists. To suggest otherwise is misleading and unrealistic.

Our technical personnel personally visited last month several color removal research operations. Two separate massive lime treatment systems were investigated. At one mill, reversion of color during biological oxidation of the effluent renders the lime treatment of little benefit in reduction of color of the final effluent. In the second lime treatment project, only one portion of the mill effluent is being treated. It is then discharged into the receiving water without biological oxidation. Such a system cannot be used at the Brewton Mill because our effluent cannot be discharged directly to the river without receiving secondary treatment.

Research in progress under a Federal grant on activated carbon decolorization of kraft mill effluent was reviewed with the researchers concerned. While their laboratory reserach has confirmed that effluent can be decolorized with activated carbon, this has not yet been applied on a pilot plant scale. Nor, for that matter, have operating parameters been sufficiently delineated to permit scale up to a commercial system if such an operation should prove feasible.

Reverse osmosis has been applied on a pilot plant scale for the concentration of sulfite mill effluents. Application to kraft mill effluents is in the initial reserach stage. This has been discussed with the researchers involved but is not yet a commercially usable process. A serious problem is the difficulty in developing adequate osmatic membranes.

Now, as mentioned at the beginning of this report, I would like to indicate our plans for the future pollution abatement action. These include:

Federal Water Quality Administration Re-Survey.

The second FWQA river and waste treatment survey to determine the effect of our new aeration system upon effluent treatment will be carried out this year.

In addition to this, our own mill personnel will continue to collect operating data under various operating conditions to enable us to assess the basic operating characteristics of the system at maximum efficiency.

We will again retain the Institute of Paper Chemistry to conduct another biological water quality study of the Conecuh-Escambia River to make certain that the ecological balance of the river is not disturbed.

With a view to improving the degree of secondary treatment our bleach plant effluent now receives, we intend to evaluate in the laboratory the effects of various treatments upon the effluent.

The first of these will study the effect of liquid oxygen addition, which has already proven beneficial in treatment of our pulp and paper mill effluent.

We have reviewed our progress to date for you; progress which has reduced the quantity of BOD we produce per ton of pulp so that we are now substantially better than the industrial average, and progress which we think is reflected in the approach we plan to take in continuing this vital pollution abatement work. Container recognizes, as any responsible corporate citizen must, that pollution abatement is an on-going business function. We cannot, and will not, rest on our record. To do so would be unrealistic and, gentlemen, if the problem is to be solved, we must all be realistic.

It would be unrealistic for this conference arbitrarily to require Container Corporation of America to reduce by 90 percent its current pretreated BOD load of 48,500 pounds, thereby denying us any consideration for the considerable in-plant improvements made since the start of this conference in January 1970. We submit that any recommendation you promulgate which seeks to impose limits of operation upon us must be referenced to a starting point which does not penalize us for the progress we have made to date. We do not agree that discharge allotments should be viewed as the ultimate method of control in this situation, but if you are disposed to use such a system, we believe it should be based on the quantity of BOD we were producing at the time this conference was first convened. It is fundamentally unfair to establish BOD reduction allotments referenced to a continually shifting baseline. If you reduce our discharge limits in proportion to our progress, you can only discourage that progress, because the allotment you set must at some point become physically impossible to meet.

In this same connection, it is unrealistic to ignore the current expansion of our pulp production facilities. We were committed to this expansion at the time of our first conference, and this is noted on page 421 of the proceedings. Any BOD allotment you establish should be based on 1,050 tons of production, one-half of which will be bleached board.

We respectuflly request that the record of this conference be kept open for 15 days so that we might review and respond to the information presented by the Environmental Protection Agency at this meeting. We urge you to review this response, the written and oral statements presented today, and the record as a whole before you make your recommendations. It should always be remembered, gentlemen, that the conditions you seek to impose through this conference bear not only on the survival of the fish and fauna of Escambia Bay, but also on the survival of industry located here.

(The second section of the Container Corporation's statement, referred to on page 309, follows:)

QUESTIONABILITY OF THE PROPOSED RELATIONSHIP BETWEEN EUTROPHICATION OF ESCAMBIA BAY AND DISCHARGE OF TREATED EFFLUENT FROM THE CONTAINER CORPORATION OF AMERICA PAPERBOARD MILL AT BREWTON, ALABAMA

We contend that Container Corporation of America's Brewton Mill does not make a significant contribution to the accelerated eutrophication of Escambia Bay. In support of this contention, the following technical and scientific information is submitted for the record.

In the broadest sense, we might approach this topic by investigating the factors which are considered to be most important in accelerated eutrophication. At the outset, we are met by a controversy in which one group of acquatic biologists represented by Keuntzel (1) Kerr, et al (2) Lange (3) and Wright (4) hold that organic carbon is the contributing factor in eutrophication, while on the other hand studies conducted by researchers such as Mackenthun (5) Sawyer, (6) Wilks (7) Edmondson (8) and Hasler (9) contend that phosphorus and nitrogen are the elements which control the rate at which eutrophication proceeds. The major arguments supporting each divergent theory are ably summarized in a recent article, The Great Phosphorus Controversy, a copy of which is attached to this statement for the record.

Frankly, we do not know whether Carbon, or Phosphorus and Nitrogen should be considered as the culprit which causes accelerated eutrophication. The important point to note here is that there is still no agreement on the matter. It is, therefore, erroneous to conclude that because Container's waste is carbonaceous in nature, it is of necessity a contributor to the accelerated eutrophication of Escambia Bay.

What is perhaps more to the point is the fact that not all forms of carbon are biologically oxidizable, and hence available to support accelerated eutrophication. Kerr, et al (2) members of the research staff of the F.W.Q.A. Laboratory, Athens, Georgia, found that:

> "The growth of individual species of organisms depends on the availability of specific utilizable forms of carbon in the system. Bacteria take up and utilize most forms of organic carbon. While most algae can take up and transform organic carbon, they grow (divide) only on CO_2 and HCO_3-2. Although the literature concerning algae growth on organic substrates is conflicting, Allen (1952), Hoare and Moore (1965), Pearce and Carr (1967) and others report uptake but no increased cell division (when compared to an inorganic control) in axenic cultures of algae grown on organic media. Also, there is no evidence that algae can utilize their intracellular carbon compounds to support growth."

To support this contention Kerr et al isolated CO_2 as on the singular algae growth stimulant in several of their experiments.

Similarly Kuentzel (1) summarizes the central theme of his literature research by saying:

> "The thesis of this paper is that bacterial action on decomposable organic matter in close proximity to the algae supplies the required CO_2 for massive algae blooms and that when such a massive CO_2 supply exists, very

small amounts of phosphorus suffice."

Whether carbon is the key factor or not in stimulating algae growth is still subject to debate, but it is certain that if carbon is to have a controlling function in the process, it must be present in a form which is biologically available so as to yield CO_2, HCO_3, or some form of carbon which the algae can utilize to produce growth.

It would seem essential to determine whether any significant residue of Container's carbonaceous waste is oxidized to form CO_2 as a result of bacterial action during the time in which it passes through Escambia Bay. More than 80% of our oxygen-demanding wastes are, of course, oxidized while in our effluent system and the balance is stabilized in the Conecuh-Escambia River. The portion of our carbonaceous waste which remains unoxidized is composed of colloidal lignin, an organic material which is essentially inert to biological oxidation. All the information we have reviewed to date indicates that this lignin portion of our carbonaceous waste passes through the river system in colloidal solution without producing significant quantities of CO_2 or, for that matter, any other harmful product.

Raabe (10) determined the extent to which lignin, a principal component of pulp and paper mill wastes, contributes a long-term B.O.D. to receiving waters. The oxygen demand of a sample of river water containing kraft mill waste waters was determined at intervals over a period of 100 days and the lignin content of another sample, set up under the same experimental conditions, was determined at the same time intervals. The results suggested that the B.O.D. of a stream containing kraft mill waste waters is related to the concentration of carbohydrates, the fraction of lignin compounds oxidizable in 100 days, and possibly to other slowly decomposable organic compounds. The fast component of the first-stage BOD is indicative of the oxidation of wood sugars and other readily decomposable materials, and the slow component of the first stage, and the second stage of the BOD, suggest the decomposition of lignin and its by-products and other decomposable organic materials. Over the 100-day test period les than 50 per cent of the lignin compounds present initially were oxidized.

As a result of his extensive research on the decomposition of lignin Haskin (11) concurs with Raabe's finding and goes on to state: "Lignin is just tremendously difficult to decompose. Any changes that do occur seem to proceed via oxidation and extremely slowly, and much of the material remains unattacked, especially in aqueous environments."

Based on the foregoing, we conclude that the lignin-derived fraction of Container's carbonaceous waste is not oxidized while in Escambia Bay and thus cannot be regarded as a potential nutrient source for accelerated algae growth. We believe that the January 1970 F.W.Q.A. report corroborates this conclusion when it states: "Container is a relatively minor contributor of Carbon and Phosphorus in terms of the effects on water quality of the bay."

In this same connection we question the validity of establishing discharge allotments for Container in terms of Total Organic Carbon (TOC). This analytical measure may have merit as a quantitative index of stream pollution, but it is wide of the mark when we attempt to determine what affect the Carbon thus measured may have with respect to promoting algae growth. Since we are concerned with accelerated euthrophication, we should ascertain whether or not the carbon in question is biologically oxidizable as opposed to merely establishing the total quantity of carbon present. We believe that any discharge allotments established by the conference for Container should be in terms of Biological Oxygen Demand (B.O.D.) as opposed to Total Organic Carbon (T.O.C.) because the former is a more meaningful index of the biological problem.

Jones (12) studied the relationship between these pollution parameters and the relevant merits of each. In his opinion, T.O.C. is a reliable index of waste loading at a given sampling point, but the B.O.D. measurement, when properly applied, determines the rate at which oxygen is depleted in aerobic stabilization of wastes and remains the best method for approximating what biochemical oxidation will eventually take place in the receiving water.

> The Institute of Paper Chemistry (13) comments that: "Total organic carbon (T.O.C.) measurements may not accurately reflect the environmental impact of kraft pulp and papermaking wastes since much of the organic carbonaceous material discharged, i.e., kraft lignins, are not readily or completely biodegradable. Raabe (1968) measured B.O.D. over a period of 100 days for river water collected six miles down stream from a kraft mill and concluded that less than one-half of the lignin content was ever degraded, although the ultimate B.O.D. was satisfied. The lignin content was measured by the Folin-Denis test as recommended by the APHA

Standard Methods, 12th Ed. Presumably, the test was negative for the river water upstream from the mill. Since the C.O.D. to B.O.D. ratio of kraft mill effluents is of the order of 5:1 (Charles and Decker 1970), T.O.C. measurements are probably some 30 to 40% higher than the actual carbon available for heterotropic microbial degradation to liberate carbon dioxide."

In further substantiation of the point that the T.O.C. measurement detects a form of carbon which is not biologically oxidizable and hence irrelevant we offer the data of Table I and the TOC:BOD ratios plotted in Figure 1. These clearly show the variable nature of the TOC:BOD ratio. It is apparent that, as biological stabilization of kraft mill effluent proceeds, the TOC:BOD ratio increases. This results from the removal of biologically oxidizable carbon and the lack of decomposition of biologically unavailable, lignin-derived, carbon.

Evaluation of the F.W.Q.A. Survey Data from August 17-28, 1970, shows the background BOD of the Conecuh River above the Brewton Mill to be 1.6 P.P.M. and the TOC:BOD ratio to be 4.18. At the inlet to the clarifier, prior to removal of cellulose debris from the pulp and paper mill effluent, BOD is a high 180 P.P.M. and the TOC:BOD ratio is 1.73. After removal of the fine cellulose fibers and passage of the effluent through the oxidation lagoons the ratio has been dropped to 0.96 with a much greater decrease in TOC than in BOD. At this point biological stabilization has proceeded for five days.

Just prior to the spillway sample the bleach plant effluent

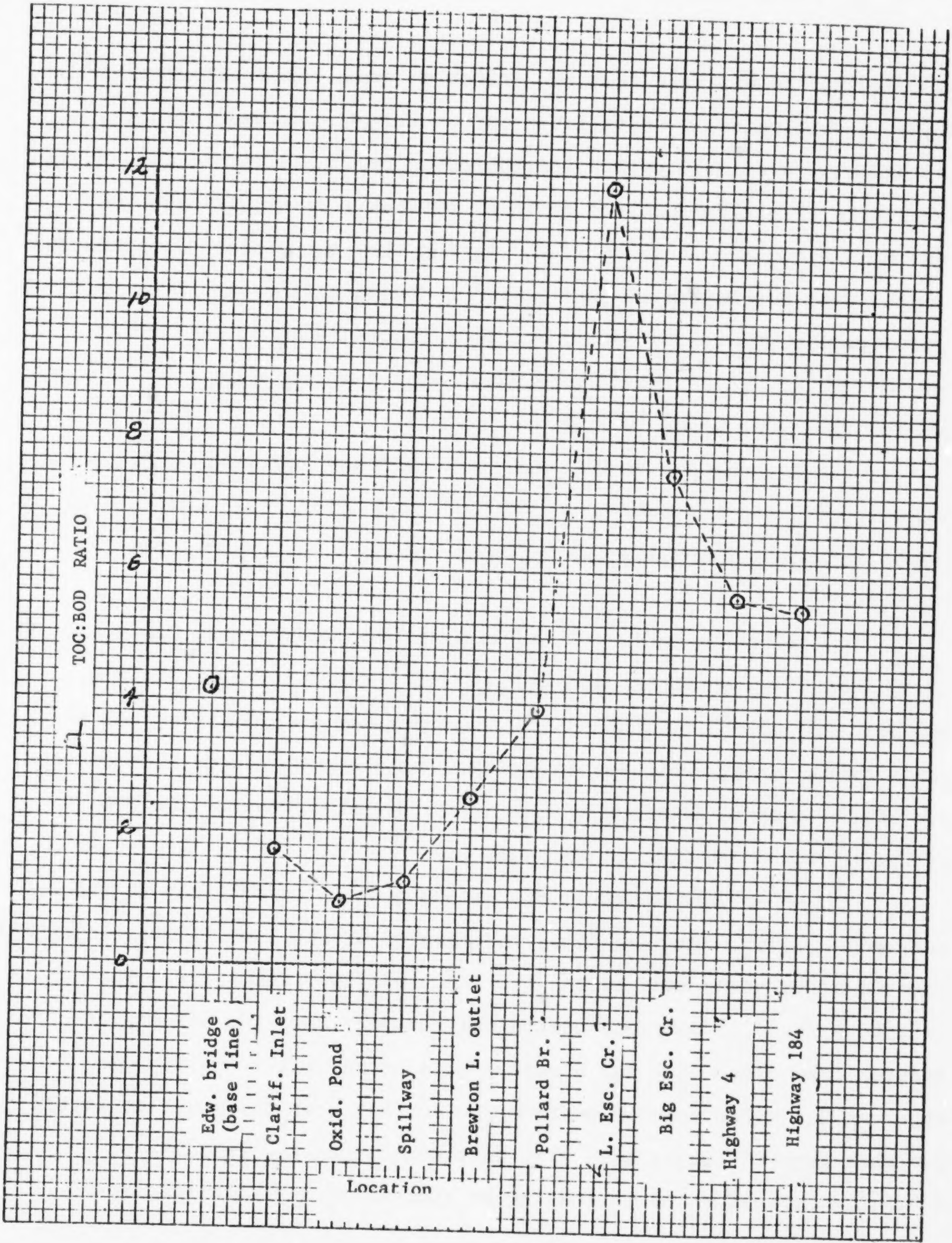
TABLE I

EFFECT OF BIOLOGICAL OXIDATION AND CARBON INPUT ON TOC:BOD RATIO*

SAMPLE LOCATION	TOC, PPM	BOD, PPM	TOC/BOD
Edwards Bridge (background level)	6.7	1.6	4.18
Clarifier Inlet	312	180	1.73
Oxidation Pond Outlet	52	54	0.96
Spillway	62	49	1.26
Brewton Lake Outfall	46	18	2.56
Old Pollard Bridge	8.6	2.2	3.92
Little Escambia Creek	10.6	0.9	11.8
Big Escambia Creek	9	1.2	7.50
Century Highway 4 Bridge	9	1.6	5.63
Highway 184 Bridge	8.8	1.6	5.50

*Data from F.W.Q.A. River and Waste Treatment Survey, August 17-28 1970

FIGURE 1 Effect of Biological Oxidation and Carbon Input on TOC:BOD Ratio



is added to the effluent from the oxidation pond. This effluent is higher in biologically unavailable carbon (lignin-derived) than in biologically available carbon (carbohydrate residues). This apparently has little effect on combined effluent BOD but adds significant TOC, raising the TOC:BOD ratio to 1.26. By the time the effluent reaches the outfall from Brewton Lake, just prior to discharge into the Conecuh River, approximately 80% of the B.O.D. has been stabilized. At this point, due to lack of proportionate biological attack on the TOC, the TOC:BOD ratio has risen to 2.56.

Largely due to dilution, both BOD and TOC show large decreases between the outfall and Old Pollard bridge. In addition to this, biological stabilization continues as does the rise in TOC:BOD ratio to 3.92.

With the influx of Little Escambia Creek, there appears to have been a significant addition of TOC without accompanying BOD.. In fact, BOD stabilization has continued and the TOC:BOD ratio has risen unexpectedly high. This possibly indicates the presence of hydrocarbons but little organic detritus in the Little Escambia Creek. The BOD figure of 0.9 could also be somewhat low.

From this location on the BOD remains essentially at the background level. This confirms the results of the June, 1970, biological water quality study made by the Institute of Paper Chemistry. The Institute found "A complete ecological recovery from the effects of Brewton Lake discharges and a return to a normal water quality was apparent 3.1 miles downstream from the outfall near the mouth of Little Escambia Creek." These data also cast doubt upon the validity of F.W.P.C.A. procedure of estimating an additional 80% stabilization of the carbonaceous effluent after its discharge from the Brewton Lake outfall (14) It appears that the biologically oxidizable carbon is essentially, if not totally, stabilized within 10 miles of its discharge from Brewton Lake outfall.

From the Little Escambia Creek location to the conclusion of sampling at Highway 184 bridge, the TOC remains essentially constant at around 9PPM, as does the TOC:BOD ratio at about 5.5. Introduction of either biologically available (BOD) carbon or biologically unavailable carbon (petroleum, lignin, coal, etc.) into the river at later points will, of course, change the TOC:BOD ratio further.

A discharge allotment couched in terms of TOC reduction which requires Container to remove the lignin-derived, non-biodegradable portion of its carbonaceous waste would clearly be inconsistent with the sound scientific approach which the solution of the Escambia Bay problem requires. Any recommendation that this conference might make which overlooks the fact that this lignin-derived carbon is not oxidized while in Escambia Bay would also ignore considerations of physical and economic feasibility which the solution of this problem likewise requires.

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(2) Kerr, et al, P. C., The Interrelation of Carbon and Phosphorus for Regulating Heterotropic and Autrophic Populations in Aquatic Ecosystems, Water Pollution Control Research Services, MO 16050, FGS. U.S. Dept. of Interior F.W.P.C.A. Southeast Water Laboratory, Athens, Ga. (1970)

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(4) Wright, J.C., Productivity of Rivers, In proceedings of Eutrophication-biostimulation assessment workship, E.J. Middlebrooks, T.E. Maloney, C.F. Powers, and L.M. Kook, Edition (1969)

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(6) Sawyer, C.M., Basic Concepts of Eutrophication Jour., American Water Works Assn. 38, 5, 737, (1966)

(7) Wilks, F.M., Science News, 98, 17, July 4, 1971

(8) Edmondson, W.T., Eutrophication in North America, In Eutrophication; Courses, Consequences, Corrections, Proceedings of Symposium, Natural Academy of Sciences, Washington, D.C. (1969)

(9) Hasler, A.D., Eutrophication of Lakes by Domestic Sewage, Ecology 28; 383-395 (1947)

(10) Raabe, E.W.J., Water Pollution Control Fed.,40 Res. Suppl. R150 (1968)

(11) Haskin, J. M., Rivision of Wood Chemistry Research, U.S. Forest Products Laboratory, private communication asc) January 5, 1971

(12) Jones, R.H., Environmental Pollution Instrumentation Symposium, Selected Papers, Chapman, R.L. (Ed.) 116-125 (1969)

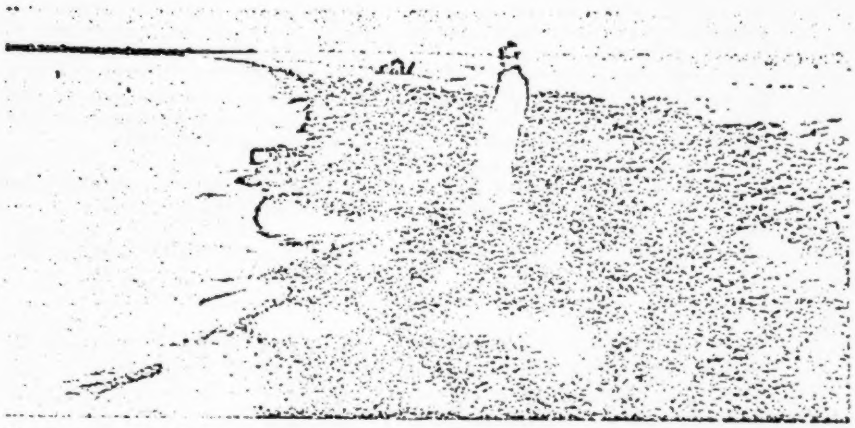
(13) Ischinger, L.S., Balch R.F., Holm, R.A., Institute of Paper Chemistry Private communication as of November 19, 1970

(14) Gallagher, T.P., Proceedings - Conference in the Matter of Pollution of Interstate Waters of the Escambia Basin, U.S. Dept. of Interior, F.W.P.C.A., 435, January 1970.

The great phosphorus controversy

Arguments over the controlling mechanisms of eutrophication have scientists—and politicians— all hot under the collar

A furious controversy over the role played by phosphorus in the excessive growth of algae in lakes and streams is currently raging within a section of the technical community. Although the arguments bandied back and forth are scientific in nature, their implications go far beyond the laboratory. The issue involved is whether phosphorus is indeed the key element controlling algal growth; the assumption that it is underlies all current efforts to remove phosphorus from sewage and to replace the condensed phosphates in household detergents with a nonphosphate substitute (see ES&T, February 1970, page 101, and July 1970, page 544).



Dieoff. *Decaying algae disfigure Montrose Beach on Lake Michigan shorefront*

An accepted fact

For many years, the key importance of phosphorus (and of nitrogen) to the growth of aquatic algae was taken as absolute fact—and indeed the majority of water chemists and limnologists (scientists who study freshwaters) never did doubt that fact and do not do so now. Studies of the eutrophication (advanced biological aging) of bodies of water have for many years focused on the increased amounts of phosphorus and nitrogen entering the water, which, in practically all cases, accompanied excessive algal growth. The connection has been accepted as so obvious and proven that no argument was really expected.

First hints of the furor yet to come appeared in 1967, when Willy Lange, a chemist turned botanist at the University of Cincinnati, published in *Nature* a paper entitled "Effect of Carbohydrates on the Symbiotic Growth of Planktonic Blue-Green Algae with Bacteria." Lange's thesis was that algae always exist in association with bacteria and that the association is mutually supportive: the algae utilize carbon dioxide and sunlight to produce organic matter and oxygen by photosynthesis; the bacteria use oxygen in the decomposition of organic matter to produce carbon dioxide. Lange's experiments proved to his satisfaction that it was the presence of large amounts of organic material in water that made the production of huge amounts of carbon dioxide available for algal growth.

Lange's contentions were picked up and given added currency in 1969, when L. E. Kuentzel, a Wyandotte Chemical Corp. physical chemist, reviewed the literature on eutrophication and concluded (without ever having performed an experiment himself, as his critics are quick to point out) that carbon, not phosphorus, is the element that controls algal growth.

Kuentzel followed Lange's reasoning that only bacterial action on dissolved organic matter could possibly produce the amounts of carbon dioxide needed for the algae to grow rapidly. According to Kuentzel, all the literature citations he studied pointed to the fact that there was sufficient organic matter present, together with phosphorus and nitrogen, to support his thesis concerning carbon dioxide production and utilization by algae. Furthermore, continued Kuentzel, in many reported cases of excessive growth, dissolved phosphorus levels were exceedingly small. So small, in fact, that they were in some cases less than the 0.01 p.p.m. previously suggested as the minimum phosphorus concentration needed for abundant growth, a criterion provided by University of Wisconsin sanitary chemist Clair Sawyer in the 1940's. Kuentzel's interpretations were roundly opposed by members of what has been called, with considerable risk of oversimplification, the phosphorus-is-the-key school of thought.

Then, at the 1970 Purdue Industrial Waste Conference, Pat Kerr, a plant physiologist at the Federal Water Quality Administration (FWQA) Southeast Water Laboratory (Athens, Ga.), presented the results of work done by her and two colleagues from which she concluded that carbon was the controlling element. Miss Kerr's results were an extreme embarrassment to FWQA and to the federal government, who were gearing up (albeit somewhat tentatively) for a switch away from phosphates in detergents and were spending heavily on the development of processes for the removal of phosphorus from liquid

Two schools of thought clash o[illegible]any points

Carbon-is-key school believes:	Phosphorus-is-key school believes:
Carbon controls algal growth.	Phosphorus controls algal growth.
Phosphorus is recycled again and again during and after each bloom.	Recycling is inefficient: some of the phosphorus is lost in bottom sediment.
Phosphorus in sediment is a vast reservoir always available to stimulate growth.	Sediments are sinks for phosphorus, not sources.
Massive blooms can occur even when dissolved phosphorus concentration is low.	Phosphorus concentrations are low during massive blooms because phosphorus is in algal cells, not water.
When large supplies of CO_2 and bicarbonate are present, very small amounts of phosphorus cause growth.	No matter how much CO_2 is present, a certain minimum amount of phosphorus is needed for growth.
CO_2 supplied by the bacterial decomposition of organic matter is the key source of carbon for algal growth.	CO_2 produced by bacteria may be used in algal growth, but main supply is from dissociation of bicarbonates.
By and large, severe reduction in phosphorus discharges will not result in reduced algal growth.	Reduction in phosphorus discharges will materially curtail algal growth.

wastes. Swept along by wide interest in Miss Kerr's work and by a long, gutsy, and polemical attack on the whole phosphorus school in *Canadian Research and Development* magazine, battle lines were drawn. Lange, Kuentzel, and Miss Kerr were, once again for the convenience of argument, lumped together as the carbon-is-key school, and their arguments were heatedly discussed by high level groups in FWQA and the Council on Environmental Quality (CEQ).

Counterattack

However, the phosphorus school counterattacked strongly and its arguments seem, at the moment, to have carried the day. Both the phosphorus and carbon schools agree that algae need, for growth, sources of inorganic carbon, phosphorus, nitrogen, and numerous other elements such as metals. Both schools further agree that algae and bacteria generally coexist, and the phosphorus school is willing to concede that the relationship may be symbiotic. But on almost all other points, they disagree (see table). At the very nub of the disagreement are two basic areas of contention:

- Precisely how much phosphorus do algae need for excessive growth.
- What sources of carbon are available to algae.

The carbon school maintains that only very small amounts of phosphorus are needed. It points to the low dissolved phosphorus concentrations found in the water of eutrophic lakes during algal blooms and believes that nutrients, including phosphorus, are recycled by organisms during growth and released for reuse during the periodic dieoff periods. Says the phosphorus school: On the contrary, algae require relatively substantial amounts of phosphorus and the incidence of low dissolved phosphorus concentrations during a bloom means that the phosphorus has been taken up by the algal cells.

The carbon school believes that the availability of utilizable carbon is the key and that diffusional processes are too slow to permit atmospheric CO_2 to support massive growth, hence its interpretation of the importance of bacteria-produced CO_2. The phosphorus school points to the fact that algae can use, in addition to free CO_2, carbon dioxide produced by the dissociation of dissolved bicarbonates. Phosphorus supporters say that the dissociation occurs so rapidly that supply of carbon dioxide cannot possibly be limiting, and they pooh-pooh the carbon school emphasis on the need for respiratory supply.

It is very easy to convey the wrong impression that all scientists fall simply into one or other of the two camps. In fact, most probably see some merit in both sets of arguments.

P[illegible]horus supporters, including University of Minnesota limnologist Joseph Shapiro, have told ES&T that they believe with Pat Kerr that carbon was indeed the controlling element in her studies. The reason for this, they say, is that Miss Kerr worked with the waters of several southern lakes in which dissolved bicarbonates are very low, and in a situation where nitrogen and phosphorus were very high. Miss Kerr herself is willing to concede that her results may not hold true "for all waters in all places at all times." She does feel, however, that removal of phosphorus but not of organic carbon from liquid wastes probably spells trouble. Phosphorus supporters continue to point out that most lakes, streams, and estuaries contain abundant supplies of inorganic carbon, and they stick with their belief that, in general, phosphorus is controlling. They do not believe that removal of phosphorus from wastes will halt all algal growth; they do believe, however, that growths will be much diminished.

Governmental bodies obviously are going along with the phosphorus school. In Canada, the federal government gave detergent manufacturers until August 1 to reduce the phosphate content of detergents to 20% (expressed as P_2O_5—roughly equivalent to 35% expressed as sodium tripolyphosphate), and is aiming toward a total ban by the beginning of 1972. The U.S. government has not gone as far, however. Rep. Henry Reuss's (D.-Wis.) bill to limit phosphorus in detergents is languishing in a Congressional committee, but FWQA scientists are working on a crash program to evaluate the ecological effects of sodium nitrilotriacetate (NTA), the most likely present substitute for phosphate in detergents. And spokesmen for both FWQA and CEQ say that they are entirely convinced of the merits of the case against phosphorus.

Whether the current furor will testify to the supremacy of science over politics, only time will tell. But one thing is sure—man has been responsible for the advanced eutrophication of lakes through something he has added to them in the course of his technological and social progress. It is not unreasonable to hope that all the work that has been lavished on the role of phosphorus in eutrophication will eventually result in ways to remove that something, whatever it eventually turns out to be. DHMB

MR. WHITE: Thank you, Mr. Whiteside.

Any comments or questions?

Mr. Traina.

MR. TRAINA: Yes. Mr. Whiteside, first let me say I think you and your company should be complimented on these in-plant controls. As a matter of fact, I was impressed this morning, and I meant to mention that, that I think industry in this whole area has done quite a bit with in-process controls and I think that point should be made.

However, I don't see from your comments here that it would be unrealistic to require your industry or any other industry to provide 90 percent treatment of effluent. I think that it is technocally feasible, and with the qualifications that Mr. Crockett had given earlier, which I can appreciate, regarding the winter situation, I do believe that technology exists--and the plant, by the way, from the report that was presented by Mr. Little this morning, is presently removing 81 percent prior to the installation of the activated sludge, and I don't see why you can't get 90 percent of what you are presently producing.

MR. WHITESIDE: Mr. Traina, 90 percent of the BOD removal is technically--it can be done. Ninety percent of TOC removal is a horse of a different feather, because I don't know of any kraft mill in the world that is doing this. If they are, I would be glad to send representatives there to learn the technology.

MR. TRAINA: I had particular reference to your statement on page 7 when you say it is unrealistic to reduce by 90 percent its current pre-treated BOD load of 48,500 pounds. This is the point I had. I know we have some difficulties with TOC, but I think on BOD we should not have any problems.

MR. WHITESIDE: Well, we are certainly going for the maximum efficiency. What I was pointing out is that when you get down--if I reduce this load by in-plant things, you may hurt the efficiency of the system. What you are looking for, I think, is a reduction of the load on the stream.

MR. TRAINA: That is right. This is what we are looking for with all of this, is we are trying to get the best we can. If we can do it with in-process controls, we will do it there and we will do the rest of it with treatment. I think this is the principle behind what we are trying to do here.

I would just like a point of clarification on another item we had with regard to your bleach plant effluent. As I read your statement, you are providing secondary treatment for your bleach plant effluent?

MR. WHITESIDE: We do this through a 5-day retention in our lake system.

MR. TRAINA: I see. It doesn't go through your clarifier lagoon system?

MR. WHITESIDE: No, because it doesn't have any fiber-bearing water, there isn't any fiber.

MR. TRAINA: Would you have problems of reducing your bleach effluents by 90 percent BOD?

MR. WHITESIDE: You are asking for an opinion and my opinion would be yes.

MR. WHITE: Well, could this--

MR. WHITESIDE: It seems to be easier to oxidize the other effluents than it does the bleach--I am speaking in terms of what I have read and have--we are getting a reduction through that system.

MR. WHITE: We have had a little conversation on this specific point with one of our technical representatives from the **northwest**. Of course this information isn't conclusive and I am sure we can explore it more in our executive session, but the statement was made that in all probability you could put this bleach waste effluent into your lagoon system and that this may in fact enhance your BOD removal.

MR. WHITESIDE: Well, we look forward to all the improvements that are brought up and if you have someone that you recommend that is doing something in this area, we would be very happy to go see what they are doing and sit down with them and find out. We have no experience in that.

MR. BECK: George, could you do it hydraulically with your present system?

MR. WHITESIDE: It can be. I think several miles of very large pipe would have to be constructed.

MR. WHITE: I would like to ask you the question I put to Mr. Crockett a few minutes ago. When will you complete your improvements for this increased production capacity?

MR. WHITESIDE: In the first quarter of next year.

MR. WHITE: First quarter of next year?

MR. WHITESIDE: Yes. The steel is going up now. Construction schedules are variable, as you know.

MR. WHITE: You will note that in the Federal report that recognition was given to this construction which you have under way and they state that the recommendation was that the conferees will consider that at a later date after we have time to assess these new facilities that just became operational in January and also assess the actual loading that you will have, which I understand we can't accurately predict at this time.

MR. TRAINA: Mr. Whiteside, in your statement with regard to your aeration system you say you have been collecting information. Is any of that preliminary data available as to what percent removal you are now getting with your aeration system?

MR. WHITESIDE: That is not comprehensive enough to report at this date. Weekly we report, I send our reports to Alabama, and you can have anything that we have sent them. Anything we have got you can have.

MR. TRAINA: It would be very helpful to have.

MR. BECK: There is no problem there.

MR. WHITE: I would like to make one other comment with respect to your statements concerning in-house improvements, and this is somewhat premature in that the program is not operational yet. I am referring to the Federal industrial permitting program.

The philosophy that is guiding the development of effluent guidelines takes into account in-house improvements in determining loads, you know, which would be allowed, but this again ties in with this conversation I got into with Mr. Crockett. While we will have effluent guidelines, these will be imposed in situations where stream conditions don't dictate that you have a higher degree of treatment. These will be a minimum degree of treatment or a minimum loading that you will be allowed, say, anyone will be allowed, and it is entirely possible that the characteristics of the stream would dictate a higher degree of treatment, I mean under certain circumstances.

But I think that these considerations will be given in this permitting program.

MR. TRAINA: Mr. Whiteside, can you give us any hope on this color removal? I know that the company has looked at this, apparently talked to a number of people. Of course FWQA is funding some of this. Any prognosis as to when we could look to see a color removal system in operation up at Brewton?

MR. WHITESIDE: You probably know more about the conditions of the grants than we do except--I mean we have made this survey to be sure of where they stand as well as anything else, and, of course, after you have a successful thing in operation, you then have to go in and design a full-scale plant and build it and put it in. I just can't give you a date in there, but I just want to point out there are time factors that are involved after you even have approved the pilot plants.

MR. TRAINA: I know there are and I am aware of the real technical problems we have in this area. I think, though, that we are a year farther down the road than we were last year, we have a year more of experience behind us in some of these projects, and I think that perhaps some consideration, I can't give any guidelines, should be made to taking a step here, a preliminary step, in terms of some lab studies and bench studies. It is probably too premature for pilot plants, but--

MR. WHITESIDE: We will do laboratory studies.

MR. TRAINA: That is fine.

MR. BECK: George, have you looked into this study that is going on at Gulf States Paper Corporation at Wacissa?

MR. WHITESIDE: That is one we missed, I believe.

MR. BECK: Which is a pilot study.

MR. WHITESIDE: We will get in touch with Gulf States. We were familiar with the people who had grants as well as various people who had public items in the discussions that came up in the Purdue meeting at Purdue and we ran down all the things that we found there.

MR. TRAINA: The Corvallis laboratory did some lab studies with the effluents that should improve our knowledge a lot. I think we maybe could start taking a small step but a step nonetheless to try and solve this. It is a real touchy, sticky problem.

That is all I have.

MR. WHITESIDE: The thing is we want to be sure that you understand that each of the systems that we know of today, if we installed a system neither you nor we would be happy with the system.

MR. TRAINA: I appreciate that.

MR. WHITE: With respect to your request for keeping the conference record open for 15 days, we will be happy to do this to allow you time to comment.

MR. WHITESIDE: Thank you.

MR. BECK: Are there any other questions of the conferees?

Mr. Chairman, that concludes my list here of people that wish to speak, unless there is somebody in the audience from Alabama that would like to make a statement.

Hearing none, I turn it back to you, Mr. Chairman.

MR. WHITE: Thank you very much, Mr. Beck.

The conferees have discussed this during the break and I think we have all decided that we need to recess, go into an executive session, which we will do in the morning. We will return and reconvene the conference at 11 a.m. in the morning to advise you of our conclusions and revised recommendations in this situation.

With that, the conference stands adjourned until tomorrow morning.

(Whereupon, at 5 o'clock an adjournment was taken until 9 o'clock, Wednesday, February 24, 1971.)

MORNING SESSION

WEDNESDAY, FEBRUARY 24, 1971

MR. WHITE: Let's reconvene.

The conferees are just out of an executive session which was announced yesterday and we have unanimously agreed on revised conclusions and recommendations that will be recommended to Mr. Ruckelshaus, the Administrator of the Environmental Protection Agency, for formal promulgation under the provisions of Section 10 of the Federal Water Pollution Control Act. These conclusions and recommendations are:

Conclusions.

The area considered by the conferees is the Conecuh-Escambia River in Alabama and Florida downstream from Brewton, Alabama, and Escambia Bay as well as Mulat-Mulatto Bayou in Florida.

The unprecedented numbers and sizes of fish kills in Escambia Bay during 1970 have provided even more evidence of the severe imbalance in water quality conditions which continue to exist. The seriousness of the problem requires that equally serious and stringent measures be taken to enable the bay to regain the natural ecological balance needed to make this water body a resource rather than a detriment to the State of Florida.

Progress has been noted since the first conference session in reducing waste loads entering the bay either directly or through its drainage system. Physical improvement in circulation and flushing patterns has also been noted. There is a lack of progress, however, in reducing or eliminating the nutrient-laden waste discharges from the city of Pensacola Northeast Sewage Treatment Plant.

The conferees commend the Louisville & Nashville Railroad Company for eliminating the excessive piling which were adversely affecting circulation and exchange of water in the bay.

The conferees also take note of the fact and commend the American Cyanamid Company for substantially eliminating the discharge of acrylonitrile to Escambia Bay.

Recommendations.

To reduce or eliminate the accelerated eutrophication of Escambia Bay and Mulat-Mulatto Bayou, and to provide water quality suitable for a wide diversity of desirable uses, the following water quality management and waste abatement program is recommended to be accomplished, except as otherwise specified, by not later than December 31, 1972:

1. There shall be reductions of 94 percent BOD_5, 94 percent nitrogenous, and 90 percent phosphorus wastes, respectively, discharged to Escambia River and Bay from major sources in Florida, including American Cyanamid, Escambia Chemical, and Monsanto. Due to the distance from Escambia Bay of Container Corporation of America's plant site, a reduction of 90 percent

5-day BOD waste will be required. These percent reductions permit the following allowable waste effluents:

Container Corporation, 4,850 pounds BOD. The provisions relating to nitrogen and phosphorus are not applicable in this case.

Monsanto. Allowable BOD wasteload of 605 pounds; total nitrogen allowable, 248 pounds; total phosphorus, 46.

American Cyanamid. Allowable BOD loading 425 pounds; total nitrogen load allowable, 323 pounds; the phosphorus requirement is not applicable.

Escambia Chemical Corporation. Allowable BOD loading of 17 pounds; allowable total nitrogen load 477 pounds; and an allowable total phosphorus load 35 pounds.

The foregoing allowable waste loads shall be obtained by December 31, 1972. If further investigation shows that these limits are excessive, Monsanto, American Cyanamid, and Escambia Chemical must develop a plan for removing their discharge from the bay completely.

There shall be maximum feasible reduction of carbonaceous organic material. All waste discharges shall monitor effluents to insure reductions and conduct feasibility studies and submit a plan of abatement for carbonaceous waste to the conferees by February 15, 1972.

The effects of Container Corporation's expansion of the mill's pulping capacity on BOD discharged will be evaluated and reviewed by the conferees at the appropriate time. In addition, Container Corporation shall provide secondary treatment to the bleach plant and wood yard waste.

2. The progress of the city of Pensacola waste abatement program has not been satisfactory. The State of Florida shall take appropriate action in accordance with State rules and regulations to assure that the Northeast Sewage Treatment Plant abate its present discharge to Escambia Bay. The State of Florida will submit to the conferees by August 15, 1971, a satisfactory plan for accomplishing this objective.

Indications are some negotiations have transpired between the Escambia-Santa Rosa Regional Planning Council and County Commissioners of Escambia and Santa Rosa Counties and the city of Pensacola; however, tangible results are not evident. The parties shall conclude negotiations at an early date and formulate a single program for the collection, treatment, and disposal of wastewaters in the Escambia River Basin. A progress report shall be furnished the conferees by April 15, 1971, by the Escambia-Santa Rosa Regional Planning Council.

3. The conferees recognize the in-plant changes made by the Monsanto Company to reduce its waste discharges to the Escambia River. The conferees require that the company shall attain the recommended allowable waste effluent limit or install

a closed circuit cooling system by December 31, 1972.

The conferees support the State of Florida's actions against Monsanto for the immediate control of the discharge of toxic polychlorinated biphenyls.

4. The Environmental Protection Agency Laboratory at Gulf Breeze, Florida, shall convene a conference of experts on menhaden fisheries. This conference shall recommend methods to limit the migration of juvenile menhaden to the upper Escambia Bay and its related bayous.

The findings of this conference will be reported to the enforcement conferees to form a basis of future action for the control of fish kills in Escambia Bay and its bayous.

5. Color in the Escambia River at the Alabama-Florida State line as measured at the Highway 4 bridge near Century, Florida, shall be reduced to levels meeting Alabama, Florida, and Federal standards. The Container Corporation of America is to continue its studies utilizing present research findings on methods for removing color from its waste discharge. The company shall report its progress to the conferees by February 15, 1972.

6. No further construction dredging shall be permitted at Escambia Bay and Mulatto Bayou until the artificial buildup of organic sediment deposits ceases and are stabilized. Maintenance dredging of existing channels shall be by hydraulic

pipeline or by hopper dredge. Disposal of all dredged materials from hydraulic dredging shall be to upland spoil sites. The Corps of Engineers is requested to provide the conferees with a listing of these sites.

7. The Monsanto Company and Gulf Power Company shall monitor their heated discharges to the river and bay and the effect of these discharges on the biota and report to the conferees quarterly results of their monitoring programs. Conferees agree to the Gulf Power Company's plans for the installation of cooling towers for its planned expansion.

8. Century, Florida, and East Brewton, Alabama, by not later than December 31, 1972, shall install secondary waste abatement facilities acceptable to their respective State water pollution control agencies.

This concludes the conclusions and recommendations which were developed and I would now like to call on the conferees for any comments that they might have concerning this or any of the matters that have been brought before the conferees at this second session of the Escambia conference.

Mr. Reed?

MR. REED: Mr. White.

First of all, I would like to thank those responsible for these lovely north Florida camellias.

I would like to thank you, sir, for your intelligent and provocative handling of this conference.

To Mr. Traina our thanks, as always, for his technical ability.

And we are always delighted to have Mr. Gallagher back in the State.

I would like to thank my colleagues from Alabama for their excellent work at this conference.

I would like to point out with pleasure the extraordinary work of Mr. Dougherty and the Northwest Regional Lab and his staff for the really fundamental progress that has been made in Escambia River and Bay this past year. My thanks includes the constant work of Lt. Zangas and his staff.

And Mr. Tisdale, my thanks always to you, sir.

I would like to commend the efforts of the University of West Florida for their continued interest in the problems of Escambia Bay.

I am delighted to see the class of young people in this room. I wish the room was really loaded with more young people, as this is their river and their bay as much as it is ours.

And I would like to look forward to a year of progress in 1971 as great as that as 1970, if not even greater.

Mr. Patton.

MR. PATTON: Thank you, Mr. Reed.

Conclusions and Recommendations

I would like to recognize two members of the congressional delegation from this area--excuse me, legislative delegation, first Senator Childers. Pleased to have you here, Senator. I think he has already shown a great deal of interest in this program. We will be happy to work with him in any way we can and hope we can furnish him any information he requires.

And Representative Roy Hess is in the back of the room. No, here he is, he has moved up. Stand up, Roy. Representative Hess introduced several bills and I think carried a big part of the burden for the Department the last time. He was the sponsor on the house side in the Environmental Control Authority bill which if it had been successful and gotten through I think possibly would have solved some of the problems that we heard about yesterday. So we will be in touch with you again and hope that we can give you and get your support this coming session.

MR. REED: Thank you again, Mr. White.

MR. WHITE: Thank you, Mr. Reed.

Mr. Beck.

MR. BECK: Mr. White, I have nothing to say only that I am happy to see the progress that has been made toward cleaning up this bay during the past year. We are happy to be here and next time this conference is reconvened I am sure that we will see progress equal to what we have seen this past year.

Just glad to be with you.

Joe, do you have anything to say?

MR. CROCKETT: No.

MR. WHITE: Mr. Traina.

MR. TRAINA: Only that the EPA office in Atlanta stands ready to assist the States, the local people or any others concerning a program for the cleanup of Escambia Bay. We are on the other end of a telephone any time you need us.

That is all.

MR. WHITE: I would like to personally express my thanks to Mr. Reed, Mr. Patton, Mr. Beck, Mr. Crockett, and Mr. Traina and all other participants and to all of you people in the audience who have been with us yesterday or today. And I would say that we do enjoy visits to this part of the country. Despite the terrible problem that you have in Escambia Bay, this is still one of the garden spots of the country as far as I am concerned.

And with that, we stand adjourned.

(Whereupon, at 11:30 o'clock an adjournment was taken.)

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CCA
Container Corporation of America

General Offices
One First National Plaza
Chicago, Illinois 60670

Phone: 312 786 5500

March 5, 1971

Mr. John White and Conferees
Environmental Protection Agency
1421 Peachtree N. E.
Atlanta, Georgia

Re: Escambia Bay, Florida Pollution Conference (February 23-24, 1971)

Gentlemen:

Enclosed is a statement of Container Corporation of America amending and supplementing the statement presented by our Mr. George H. Whiteside to the Conference on February 23, 1971.

We wish to thank you for holding the record open to afford us the opportunity to submit this supplemental statement and we request that you contact Mr. Whiteside at our Brewton Mill for continued assistance and cooperation in implementing the recommendations of the Conference.

Very truly yours,

CONTAINER CORPORATION OF AMERICA

By Donn Jennings
Donn O. Jennings
Senior Vice President

RHW/wlj
Enclosure

Mr. John White and Conferees
of Escambia Bay, Florida
Pollution Conference -- (February 23rd, 24th, 1971)

Gentlemen:

You have recommended that we reduce by 90 per cent the BOD generated in producing 900 tons of pulp. It appears to be the EPA's position that such a requirement is not impossible to accomplish, or indeed uncommon. There are two areas to which Container, or for that matter, any other industrial concern may direct its efforts in order to reduce BOD. The inherent capacity of the plant to generate BOD may be reduced through in-plant control, or in the alternative, we may increase the efficiency of our treatment process in an effort to further reduce the BOD load that the plant discharges. We have since the initial Conference in January 1970 accomplished extensive in-plant control and cannot go much further in this direction within the parameters of existing technology. By using our current BOD load as a base line for the reduction required, you ignore the in-plant reduction we have already accomplished and force us to attempt to work the entire BOD reduction through improved treatment efficiency alone. It is well recognized that any additional increment of treatment efficiency is very difficult to achieve when one is already operating at a high level of treatment. As presently phrased, your recommendation fails to consider these facts and thus references the reduction you require of Container to a base line which does Container serious injustice.

We must note for the record, that a conference of similar composition has just established a 5100 BOD allotment for the St. Regis Cantonment Mill. This figure was reached through reference to the industrial average for southern kraft mills. We are in accord with this industrial average approach and have said so in our statement, but we are hard pressed to understand how you can adopt this standard for one mill and not for another producing approximately an equal quantity of pulp in the same area.

To avoid the inequitities noted herein we urge you to reconsider the recommendation you have promulgated for Container. We believe that any allotment you recommend should be referenced to the base line as established when this Conference first convened (January 1970) or to a relevant industrial average.

We note that the most recent session of this Conference recognized the dependence of biological stabilization on seasonal variations of temperature. All other deliberations of the "Conference in the Matter of Pollution of the Interstate Waters of Escambia River Basin (Alabama-Florida) and the Intrastate Portions of the Escambia River Basin Within the State of Florida" have tacitly overlooked the significant effect that seasonal temperature variation has on the efficiency of secondary treatment systems.

The majority of public statements and reports on biological oxidation efficiency (BOD reduction) refer to treatment efficiencies determined under summer operating temperatures. Such is understandable since this is the time of greatest water quality problems when maximum BOD reduction is essential. It nevertheless is well recognized that biological stabilization is temperature dependent, particularly in lagoons, aeration lagoons and stabilization basins. Eckenfelder[1] Wiley [2] and Carpenter, et al [3] show this for pulp and paper effluent stabilization. Our own experience confirms this temperature dependency as shown in Figure 1. We contend that this effect must be taken into consideration by the Conferees in the establishment of any effluent treatment specifications.

The EPA reports presented at both sessions of this conference imply that Container's effluent contributes to the sediment deposits of Escambia Bay. This implication is unsupported by any evidence or data presented to this Conference or indeed, by evidence from any source whatsoever. It should be noted that studies conducted prior to the start-up of Container's Brewton Mill clearly demonstrate that sludge deposits have always existed in this estuarine complex.[4, 5]

Ballinger and McKee[6] observed that: "There seems to be no standard definition or classification, and therefore disagreement may exist concerning the source, nature and significance of a bottom sediment in a particular site." Suffice it to say that reasonable men can differ on the nature and composition of sediment deposits. Based on a continuing study of reported research in this area, we wish to note for the record that our effluent does not contribute to the sediment in Escambia Bay.

The points stressed in this narrative demonstrate once again that this is indeed a complex situation to regulate. If a just and equitable solution is to be produced by this Conference such details must be thoroughly considered and evaluated and hence we urge you to deliberate on these points before reaching your final recommendation.

1) Eckenfelder, W. W. Jr., Industrial Water Pollution Control, McGraw-Hill, New York, 1966, pp. 207-9

2) Wiley, A. J., Personal Communication: 1971.

3) Carpenter, W. L., Vanvakias, J. G., and Gellman, I., Temperature Relationships in Aerobic Treatment and Disposal of Pulp & Paper Waste. J-WPCF vol 40 #5, pp. 733-740, May 1968

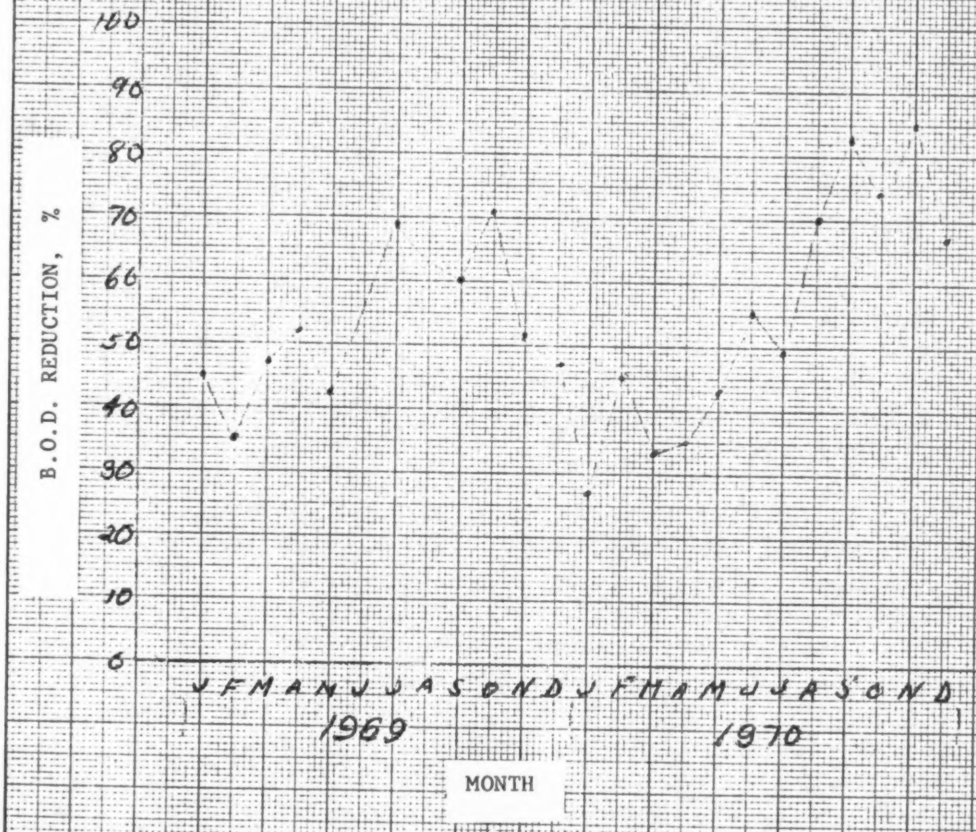
4) A Biological Survey of Conecuh-Escambia Rivers in the Vicinity of Brewton, Alabama, 1957; Institute of Paper Chemistry, a progress report to Container Corporation of America, project 2024, Dec. 10, 1957

5) Academy of Natural Sciences of Philadelphia, 1951, Escambia River, Florida, Vicinity of the Chemistrand Corporation Plant, Fall, 1952 -- Spring, 1953; 165 pages

6) Ballinger, D. G., and McKee, E. D., Chemical Characterization of Bottom Sediment. J-WPCF vol 43 #2, pp. 216-227, February 1971

FIGURE I

SEASONAL EFFICIENCY OF OXIDATION LAGOON AT CONTAINER CORPORATION OF AMERICA PAPERBOARD MILL, BREWTON, ALA.



THE CITY OF PENSACOLA FLORIDA

March 9, 1971

Mr. Vincent D. Patton
Executive Director
Florida Department of Air
 and Water Pollution Control
Suite 300, Tallahassee Bank Building
315 South Calhoun Street
Tallahassee, Florida 32301

Subject: Escambia Bay Federal-State
Enforcement Conference

Dear Mr. Patton:

Your letter of 1 March 1971 addressed to the Acting City Manager of Pensacola with reference to the subject conference is appreciated.

The City regrets that a regular City Manager was not available to attend the conference. As you may know, the City has been rotating that position since 1 February among various staff personnel. In the absence of a regular City Manager, the Director of Public Utilities would have attended such a conference. However, this director was in New York, during the time the conference was in progress, in order to close a Utility Bond Sale. A substantial amount of money from the Bond Issue will be used, of course, in pollution abatement measures by the City of Pensacola. In that Director's absence, the Superintendent of the Sewerage Division was available and did attend the conference.

Mr. Vincent D. Patton
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March 9, 1971

The City appreciates the fact that the conferees are holding the record of the reconvened session open in order for the City to provide a report with respect to the Northeast Sewage Treatment Plant. That report is enclosed.

Sincerely yours,

Peter A DeVries

Peter A. DeVries
Acting City Manager

Enclosure

cc: Mr. John White ✓
Environmental Protection Agency
cc: Mr. Bryant Liggett, Mayor
City of Pensacola
cc: Escambia-Santa Rosa Regional Planning
Council

8 March 1971

REPORT ON NORTHEAST SEWAGE TREATMENT PLANT
ESCAMBIA BAY FEDERAL-STATE ENFORCEMENT CONFERENCE

An Escambia Bay Enforcement Conference was held in Gulf Breeze, Florida in January of 1970. That conference recommended that the City of Pensacola's Northeast Sewage Treatment Plant reduce the carbonaceous waste contributions to Escambia Bay by 94%, the nitrogenous waste by 94%, and the phosphorus waste by 90% no later than December 31, 1972. At an Interstate Conference in Atlanta in May of 1970, the City proposed that a Pilot Plant Study for nutrient removal was planned for this plant. In June 1970, in the DAWPC office in Tallahassee, the City advanced details of the proposed Pilot Plant Study. These details appeared to be generally acceptable. However, it was pointed out at this meeting that the City would incur delay in performing this Pilot Plant Study because of flood damage to utilities that had commenced in early June 1970 and that this flood damage was related to the City's financial structure and ability to pay for the study. Accordingly, the study was not commenced until after a Presidential Declaration of a National Disaster had been made that included damage to the City's utilities.

The Pilot Plant Study and the development of the data into a report form extended through October, November, and December of 1970. This report was submitted to the DAWPC on 5 January 1971. At the time of submission of this report, it was indicated that discussions would be held with the consultants to determine appropriate direction(s) with respect to nutrient removal. In subsequent discussions with the consultants in the interim of the past few weeks, the City has established that the eventual use of the Northeast Sewage Treatment Plant would be treated in a long-range Master Sewerage Plan to be completed in May 1971, that is being developed for the Escambia-Santa Rosa Planning Council.

The City understands that, apparently, consideration is being given to the possibility of pumping either (a) waste that is partially treated from the Northeast Plant, or (b) pumping completely untreated waste from that location and completely abandoning that facility as it exists today. It also appears that rough-order costs will be developed to accomplish the pumping of sewage (either treated or partially treated) or, the feasibility of making extensive modifications to that existing facility that will accommodate the new standards.

A copy of this report is being sent to the Escambia-Santa Rosa Planning Council with the request that copies of the Long Range Sewer Plan be furnished to the City as soon as they are received, in order for the City to offer the report to the DAWPC, together with an evaluation by the City with respect to the Northeast Sewage Treatment Plant.